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## THE STANTON STREET LIGHTING STATION.

BOTH ARC AND INCANDESCENT LIGHTS TO BE HAD AT ANY HOUR OF THE DAY OR NIGHT — THE BUILDING DESCRIBED — THE BOILER-ROOM — THE ENGINE-ROOM — THE DYNAMO-ROOMS — THE SWITCHBOARD — THE LIGHTNING PROTECTORS — THE MEANS OF DISTRIBUTION — LOOKING OUT FOR ACCIDENTS — ADVANTAGES OF THE WESTON ARC LAMP AND THE MAXIM INCANDESCENT LAMP — PRECAUTIONS TAKEN BY SKILLFUL MEN.

The visitor to New York, if he turns from the Bowery eastward through Stanton Street, will, when he has proceeded but a short distance, have his attention drawn to a hand-some brick building of somewhat curious design. Should curiosity or other motive tempt him to enter, he will find himself, not in a well-fitted office, as the general expression of the exterior seemed to promise, but in a boiler-room resembling not a little the after-hold of a great steamship.

On either side of the well-polished passage-way he will see the heads of the great steel boilers, which lie in series. Passing through an open door-way at the north end of the room, he will discover several engines at work, but so noiselessly that he will not have become aware of the fact until he has looked upon them. On inquiry, he will learn that this building, with its boilers, engines and electrical apparatus, constitute the principal station of the United States Illuminating Company, and that, amongst the electricians who have examined it, it is regarded as a model of mechanical and electrical skill and practical efficiency. From this one station there are twenty-six circuits. These extend from the Battery to 99th Street—about eight and one-half miles. Lights generated by its engines and dynamos extend from the Hudson to the East River; they light up the Battery Park, Cortlandt Street Ferry, City Hall Park, and Washington Square. On the way up-town the United States Illuminating Company's lamps, charged with electricity from the Stanton Street Station, are made to light up Broadway and Fifth Avenue.

In a great struggle between all the electric lighting companies, some time since, for the lighting of the great East River Bridge, the contract was awarded to the United States Electric Lighting Company; and so it comes that from whatever direction a ship approaches this island, whether from Long Island Sound or from Sandy Hook, the first lights it will make will be those of this Company.

As said before, the Stanton Street Station is a model of its kind. Within its walls are grouped the mechanisms which, being the handiwork of the most skillful and ingenious mechanics, electricians and engineers, have made it possible to control, virtually, the lighting of more than a score of square miles of the area of a densely-populated city from a central station—a system in which there have been few slips that engineering skill could have been expected to foresee, and not one single accident caused by blundering, stupidity or carelessness.

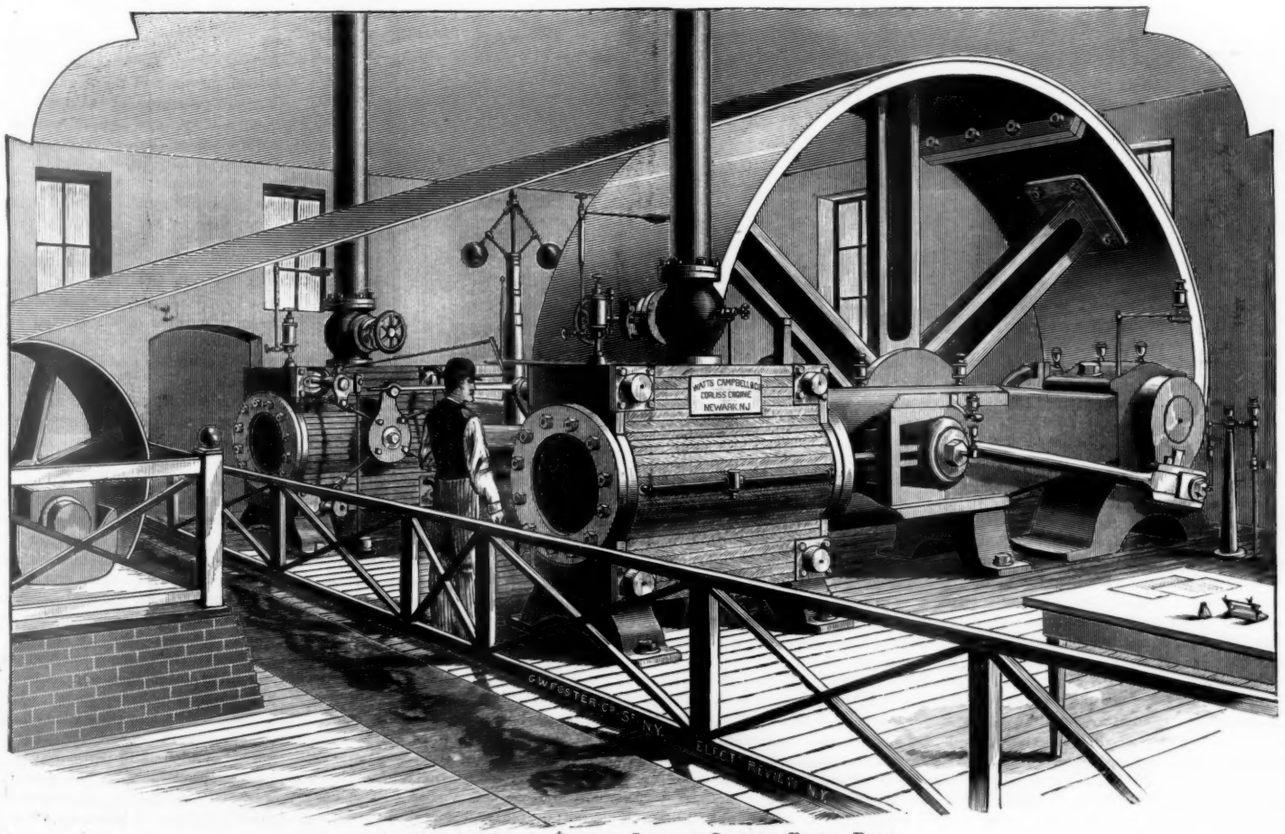
From sunrise to sunset, and from sunset to sunrise, there are engineers in each department, ready at a moment's warning to make what changes are necessitated by the neighborhood of arc wires to buildings which are afire, and to look out for whatever other exigency may arise. Discipline and efficiency prevail from bottom to top of the Stanton Street Lighting Station.

The station proper consists of a building 58x100 feet. It is built of brick, with brownstone trimmings. The boiler-room is 54x47 feet. Near the partition wall, which separates the engine-room from the boiler-room, are two large chimneys, which furnish the draft for the boilers. The flue in this chimney is three feet by six feet, and 100 feet high. After leaving this room you enter the engine-room. On one side of the engine-room are located the engines, two in number. They are of the Corliss type, built by Watts, Campbell & Co., of Newark, N. J., and have given perfect satisfaction, and are peculiarly adapted to this class of work. The parts are admirably fitted, and all bearings and boxes are ground to their several places, thus making a very accurate, close working machine.

These engines drive a seven-inch steel jack-shaft, which revolves at the rate of about 175 turns a minute. The bell used on this shaft is 60 inches wide and 120 feet long. This is the largest belt in operation in the city of New York, and the largest but one in the world.

The power for the dynamos is received from intermediate lines, driven from this seven-inch steel jack-shaft. The belts used on these intermediate lines are respectively 36 and 42 inches in width.

The mason-work supporting the fastenings of the seven-inch jack-shaft is put down to a depth of ten feet, laid upon Portland cement. Iron plates, 4x5 feet, on the top of this masonry support the boxes for the shaft. These are firmly bolted to the masonry beneath, and form a very substantial foundation




THE STANTON STREET ELECTRIC LIGHTING STATION—ENGINE ROOM.

There are eight horizontal steel boilers, 66 inches in diameter and 16 feet long. They were specially designed for this station. These boilers, under a pressure of 85 pounds to the square inch, generate 125 horse-power each.

In connection with the boilers, there is a Barryman heater which feeds them with water of a temperature of 200° Fahr. There is no loss of steam in this instance, as the water is heated by the exhaust or waste heat from the engine.

The admirable arrangement of the engine-room and the working of the engines, in which the maximum horse-power, with the minimum consumption of coal, is at all times obtained, is due in great measure to the skill of the chief engineer, George W. Campbell, M. E., who, as might be inferred, is as well acquainted with the theory of engine construction as he is with its application.

It is safe to say this type of the Corliss engine never appeared to better advantage than in this engine-room in charge of Mr. Campbell.

It should be said that the large engine is nominally of 500 horse-power, but has been run up to 600. Its main fly-wheel is 20 feet in diameter, 5 feet wide, and weighs 20 tons. The smaller engine is of 125 horse-power (nominal), but has easily run up to 200 horse-power.

On a run of fourteen hours, the large engine was ascertained to consume, on the average, only $2\frac{3}{4}$ pounds of coal per horse-power per hour.

Leaving the engine room you enter the lower dynamo room, 48 feet by 75 feet. Through the center of the room there is a passage way, and on both sides are located the machinery and dynamos, thus giving free access to all parts which may require inspection. In this room and the larger dynamo-room overhead, there are 60 dynamos of ten, fifteen, twenty, and thirty lights capacity each. The dynamo rooms are in charge of the dynamo superintendent, Mr. A. E. Scoullar. There are two lines of dynamos above and below operated by the large engine; one line above operated by the small engine. The circuits from the dynamos and from the outside lines are all brought to a large and ingeniously constructed switchboard (see engraving of switchboard) by means of which the dynamos can be coupled together in any way desired. Any outside circuits can be coupled together, and any of the outside circuits can be coupled to any of the dynamos, and changed in very quick time from one battery of dynamos to another, and without affecting the others to an appreciable extent.

The switchboard is also arranged so that the dynamos can be put on either engine. They can be readily changed from the night to the day engine. All the wires leading to this switchboard are encased in wooden mouldings in the ceilings overhead. This, besides being a very fine piece of joiner work, results in keeping the wires out of the reach of careless or maliciously disposed persons. The machinery is so designed that, in case of accident to one line of shafting, another can be at once connected by a system of clutches.

Any combination of circuits can be made with any combination of machines by means of the switchboard. The circuits are connected with the machines by cables There is a plug on either end of the cables—one end connected with the circuits, the other with the machines. The lightning arresters are placed on each circuit. These are placed there to prevent the lightning from reaching the dynamos.

The circuits are extended from the switchboard in regular order, so that the lamps may be adjusted to each circuit. These lamps can be taken out and put in without injury to the outside circuit.

The circuits are admirably arranged, being brought in and numbered from one to forty consecutively.

The switchboard, which was designed by Mr. E. A. Scoullar, is the most compact and most easily manipulated of its kind.

There is a testing-room in the building where all lamps are tested upon the circuit n which they are to burn, and this department is under the personal superintendence of Mr. E. T. Lynch, Jr.

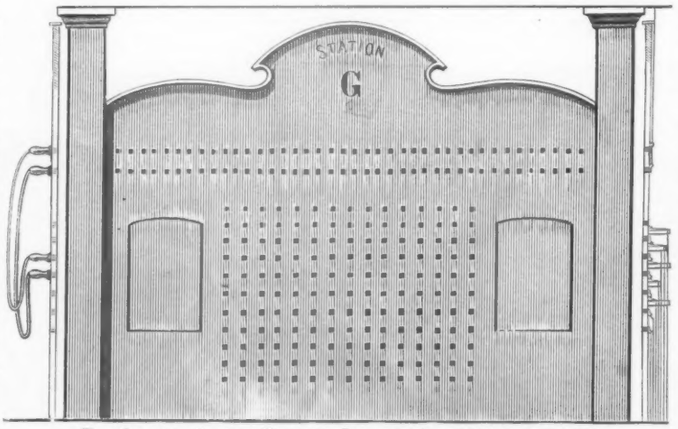
The machines used in the Stanton-street station, for both the arc and incandescent lighting are of the same general type, the principal difference between them consisting in the winding of the armature and field coils, which is varied to produce the different qualities of current required.

The current generated by these machines is continuous, and free from pulsations, thus rendering it less dangerous.

In both the arc and incandescent systems, in the Stanton-street station, the regulation of the machine is entirely automatic. Lights may be turned on or off at will, and a corresponding change is at once made in the current generated and in the amount of power required for driving the dynamo.

A marked peculiarity of the Weston arc system is the shortness of the arc or separation between the carbons, being about one-thirty-second of an inch in length, as compared with one-sixteenth to one-eighth of an inch in other systems. This enables a given number of lamps to be worked with a current of correspondingly low tension. The comparatively low tension and freedom of the current from all vibrations or pulsations, which is true of the Weston current, is thought by many—indeed, a well-known electrician testified recently in court—that it is absolutely much safer than one which does pulsate.

From the Stanton Street station 576 arc lights are fed, and a large number of incandescence lights.




THE STANTON STREET ELECTRIC LIGHTING STATION SWITCHBOARD.

Considering how recently this station was established, this is certainly a fine showing. Incandescence lighting is to be a feature of this station. These little incandescence lights are of about 16 candle-power intensity, equaling in luminosity the ordinary five-foot gas burner. These little lights are especially designed for use in the dwelling and the office. They do not poison the air as coal gas does, neither do they throw out sulphur into the atmosphere. Glowing in a vacuum, they do not touch the air at all; indeed, the air would be fatal to them. They can be readily turned on or off, and, unlike all other species of lighting, they cannot do any injury to the youngest child, even if the little glass bulb that surrounds them were broken; for the instant this happened, the total combustion of the carbon would take place.

In this as well as in the arc system, an efficient generator is of prime importance, but economy is also largely affected by the construction of the lamps. The essential requirements of an economical incandescent lamp are efficiency in the production of light with a minimum expenditure of electrical energy and great durability.

The Maxim lamp, which is used from the Stanton Street station, fulfills these requirements in a very perfect manner. It is said to produce more light for a given expenditure of power, and to last longer than most of the incandescent lamps now made. The peculiar process by which the carbon conductor is made gives it remarkable strength, durability, and capacity for withstanding the disintegrating effects of powerful currents. One of these lamps, constructed to give a light of twenty-five candles, was run for a short time at the Paris Exposition at an illuminating power of eleven hundred candles. When run at their normal candle-power, the lifetime of these lamps is very long.

It is stated that in commercially operated plants the average life of these lamps has been found to vary from 1,500 to 2,000 hours.

Thus, as will be seen, the Stanton street is a genuine lighting station, its patrons being, by no means restricted to one system of lighting. They may have either the arc or the incandescence system, and they may rest assured when they order lights at this station that they will be well and constantly served. There is no excuse department connected with the Stanton street electrical station. Care is taken, before the light is turned on to a new district that everything is in order and that the company is thoroughly prepared to carry out the contract effectively and satisfactorily.

As said before, the arc system used here is the Weston; the Incandescence, the Weston-Maxim and the Station are operated by the United States Illuminating Company, which is the sub-organization for this city of the United States Electric Lighting Company.

This Company is operating three other similar stations in the city; one on East 44th Street; one on Fulton Street, near Greenwich; and one on Elm Street, near Reade.

This vast business, which has grown up in less than two years, is evidence, not only of business enterprise, but also of the merits of these systems of lighting.

## Sir William Siemens.

In commenting upon the career of Sir William Siemens, the great electrician, who died on the 19th ult., our esteemed contemporary, *Engineering*, says:

"On the 19th instant, at nine o'clock, a great man passed away from among us with startling suddenness—a great man in the sense in which Watt and Faraday were great—a man who has left an indelible impress upon the science and industry of his age and of the future.

"Just a fortnight ago Sir William Siemens was returning from a managers' meeting of the Royal Institution with his friend, Sir Frederick Bramwell, when not noticing in time the curbstone of a pavement, after crossing a street, he fell heavily, with his left arm under him; he was a good deal shaken by the fall; the next and several successive days, however, found him at his office in Westminster. But the exertion proved too great, and almost for the first time in his long career he was compelled to lay up. On the last Thursday that he visited Westminster he had spent the whole morning in dictating to his secretary, Mr. E. F. Bamber, a large portion of the address which he was to have delivered last Wednesday as chairman of the Council of the Society of Arts. In the early morning of Saturday Sir William awoke with an acute pain in the region of the heart, and with coldness in the lower limbs, but the remedies that were applied—hot baths and friction—removed the pain, and we are glad to learn he did not suffer much afterwards. There was also some congestion of the left lung, but this passed temporarily away, and Sir William was out of his room, and spent two or three days in the drawing-room; indeed, so successful seemed the remedies applied that on last Saturday he was to have gone to his country seat of Sherwood, Tunbridge Wells, where it was hoped he would be able to get that complete rest which was absolutely necessary to his recovery. But on Wednesday, the 14th, he seems to have got a chill, which settled on his lungs, for on that night he was taken with an attack of shortness of breath and difficulty of breathing, and, although not actually confined to his bed, he never left his room again. On the last day, and within four hours of his death, two medical men had consulted together and had spoken hopefully as to his state of health, so that no one was prepared for the sudden ending; and although heart disease, probably intensified by the fall, was the immediate cause of his death, we think there can be little doubt that Sir William Siemens has literally immolated himself on the shrine of work.

"What a laborer he was a glance at his daily occupations will show. His secretary was with him at nine o'clock very nearly every working day of the year; there was work for one society or another to be done, proofs of the abstracts of the Institution of Civil Engineers to be examined, letters and opinions on scientific subjects to be dictated, frequently also specifications of new inventions already schemed out. Then followed the walk across the parks, almost at racing speed, to Westminster; the business of the Landore-Siemens Steel Company; of Messrs. Siemens Brothers & Company, Limited (of both which large undertakings he was chairman); the work in connection with the furnaces and metallurgical operations of which he was the inventor; visitors and inquirers to be seen, and in the afternoon attendance at council meetings of the learned societies or directors' meetings of various companies. The evenings, again, were spent at one or other of the learned societies. This gives a faint idea only of the way Sir William Siemens passed his weeks and months and years. Little wonder, then, that he broke down when he was just over sixty years of age.

"When we come to consider the numerous societies with which Sir William Siemens was associated, and in all of which he rose to be a member of the council or to the presidential chair, we at once understand what an enormous strain must have been put upon his mental organization. When a man has to address himself, within the space of an hour, to subjects so different as those, for instance, of telegraphy and metallurgy in their scientific aspects; when he has to consider workmen and wages one moment, licenses and specifications of inventions the next; when, as was constantly the case, half-a-dozen people were waiting at the same time to see him, each thinking his own business the most important, and to each of whom Sir William gave his attention, the wonder is that he has been able to work so long.

"Sir William Siemens was heart and soul and mind an engineer—an embodiment of his own great subject of energy. It was not a question with him alone what could be got out of nature in general, but what could be got out of himself in particular; how could he best spend his days and years in useful work? Of relaxation, except such as is produced by change of labor, we verily believe he knew none; but a short and succinct account of what he has done will better describe his right to be considered a benefactor of his race than any further words of ours."

PORTLAND.—The annual meeting of the stockholders in the Consolidated Electric Light Company of Maine was held at the office of the company in this city Dec. 12th. The meeting was largely attended and general satisfaction was expressed with President Thomas's report. The consolidated company was organized last summer and adopted the American system of electric lighting, as the best one before the public. Operations were commenced in September, and the 100 light sta-

tion of Old Orchard Beach, which was built by the American company last summer, was acquired ; a 150 light plant has been completed in this city, and is now in successful operation, earning profits far in excess of the expectations of the directors, when the company was organized. The plant will soon be increased to a full two hundred light capacity, as the business is rapidly increasing. The contract made with the American Electric and Illuminating Company, of Boston, for the construction of a two hundred light station in Lewiston, is nearly completed, and it is expected that one hundred lights will be turned on in Lewiston and Auburn next week. Since the company began business its operations have been pushed with great vigor and business tact, notwithstanding the strongest possible opposition has been encountered from competing companies, who have used every means possible to oppose and destroy public confidence and stability. This has been particularly the case with the New England Western Electric Light Company, whose officials and employes have used the most dishonorable means to attack the American Company and its officers here, as in other places, throughout New England. The business has continued to grow rapidly, on its merits, and the lights are continually increasing in popularity. Orders are now coming in from nearly all the cities and towns in the State, of sufficient size to support a station for the construction of the same. The following directors were, to-day, elected for the ensuing year : The Hon. Franklin Rollins, Collector of the Internal Revenue ; Payson Tucker, General Manager of the Eastern and Maine Central Railroad ; Chas. R. Milliken, President of the Portland Rolling Mills ; William A. Woods, George A. Thomas, D. W. Coolidge, Elias Thomas, all of Portland ; the Hon. Joseph R. Bodwell, of the Bodwell Granite Company, Hallowell, Me. ; the Hon. George C. Wing, Auburn, Me. ; Henry Staples, Old Orchard, Me. ; William A. Cromwell, of the Lake Shore and Michigan Southern Railroad ; Silas Gurney and Edward H. Goff, of Boston.

The value of imports of merchandise in the twelve months ended August 31st, is $706,804,564; for the previous twelve months $742,008,913 ; decrease this year, $35,340,-349. Value of exports of merchandise in twelve months ended August 13th, $820,-710,919 ; for the previous twelve months, $737,325,758 ; increase this year, $83,385,-161.

### Experiments With Electric Light Wires.

Experiments were made on the 18th inst., at Newark, N. J., in the United States Electric Light Company's factory to show that the danger from electric light wires had been overestimated. A fifty light arc machine was placed in circuit with fifty lamps, and a number of persons took hold of the naked wires without feeling a severe shock. A stream of water was then played on these wires through a hose with a metal nozzle, and those holding it were not injured, nor did they feel the least shock.

The positive and negative wires of the fire alarm telegraph and electric lighting system of Newark, on Broad street, were bared so as to expose the fire wires, two of which are positive and two negative, and then a very powerful current of electricity was sent through them. A man held a brass nozzle in his hands and played a stream of water on the wires. No injury was done and no shock was felt.

### "Dynamic Engineering."

ESTABLISHMENT OF A NEW CHAIR IN WASHINGTON UNIVERSITY.

At a recent meeting the Directors of Washington University created a new chair of dynamic engineering. It will include, with what was formerly known as mechanical engineering, the application of electricity to the arts. The two great forces with which mechanism will in the future concern itself are steam and electricity. The practical application of these forces, with a full knowledge and use of the theories involved, will be taught under the head of dynamic engineering. No endowment has yet been secured for the new chair, and hence application was recently made to the Secretary of the Navy for the detail of an accomplished engineer who should act as Professor of Steam Engineering, in accordance with the act of Congress authorizing such detail. Acting upon this request Secretary Chandler has detailed Assistant Engineer, William H. Alderdice, who will enter at once upon his duties at the University. Prof. Woodward received notice by wire that the detail has been made. The University is fortunate in the matter, and at least one important branch of the new professorship is for the present filled.

### Interesting Experiments with Arc and Incandescent Burners.

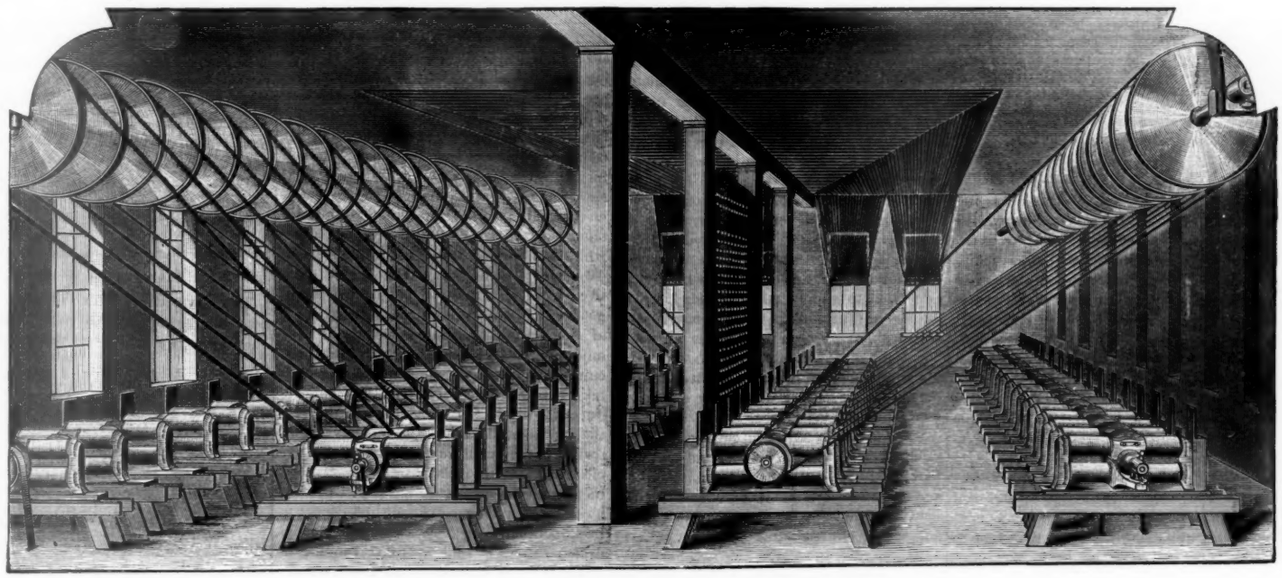
The exhibition of the Brush-Swan electric light at the National Museum, Washington, on the 11th inst., was attended by about three hundred people, who listened with great interest to the explanation of the system given by Mr. Hayes. Upon the lecturer's desk, in addition to the portable light, was a large globe of water containing a gold fish. One of the electric lights was anchored under the water, enabling the movements of the fish to be seen with great distinctness. A small motor was driven by the current from the storage battery, and a larger one by wires running directly from the dynamo.

The arc light from the tower of the Smithsonian sent its rays flashing in every direction, almost obscuring those of the moon when they came in opposition. The light was thrown into Alexandria, as promised, and ordinary print could be distinctly read by it.

In his explanation, Mr. Hayes laid great stress upon the perfect safety of the incandescent light fed from storage batteries. He said that two persons might join hands and let the whole current pass through them without any perceptible shock.

### The Baxter Engine in Hoboken.

The North German Lloyd's steamship Company have an instalment of 45 arc and several incandescent lamps in operation on their wharfs at Hoboken. The engine used is a Baxter vertical of 50 horse-power, and it does its work in a very thorough manner. Of the many engines especially adapted for electric lighting purposes, the Baxter has many features to commend it.



The Stanton Street Electric Lighting Station—The Dynamo Room.

### Electricity for a Horse.

*Peck's Sun* is responsible for the following :

"About three weeks ago you had an item in your paper telling about a new scheme for curing balky horses. It was an electric battery to be placed in the buggy, with wires running to the horse's bit, and when the horse balked the instructions were to touch a button with the foot, when the electric current would go to the horse's mouth, take his attention from his balkingness, and he would get along all right. Do you remember such an item ?"

The editor scratched the bald spot on his head, looked wise, and said he did remember something about it, and asked the visitor if he had purchased the battery and tried it.

"Tried it !" said he, as he picked up one of the crutches and fixed the splints on his sprained arm. "Yes, sir, I tried it, and it is a wonder I am spared to come in and maul you. I live out near Eagle, and have got an old mare that has been balky off and on for sixteen years. I read about that battery, and sent to Chicago and got one, and rigged it up to the bottom of the wagon and fixed the wire in the bit just as you said. One morning, about a week ago, I hitched up the old mare to take a few cans of milk to the cheese factory, and I was afraid she wouldn't balk so I could cure her. Well, I got almost to the cheese factory, and the old mare balked. I touched the button with my foot, and I could see that the old mare got the shock, because she stuck up her ears and shook her head. Just as I stepped on the button again, to give her a second dose, she switched her tail around the wire, which was quite slack, and wound it around her tail about four times, and my foot was on the button. Oh, how she kicked ! I forgot to take my foot off the button, in the excitement, and kept the electric current going, and the air was full of heels and pieces of wagon, and milk cans and me. She seemed to have the strength of a hundred horses, and it seemed to me as if the whole conveyance, horse and all, went over the trees as though carried by a cyclone. I and the wagon came down first, and then it began to hail milk cans and rain milk, and the old mare stood there with the copper wire wound around her tail, kicking and pawing milk cans and tipping pieces of wagon on me. The boss of the cheese factory got me by one leg and pulled me out of the wreck, and one of the neighbors got hold of the battery and pulled the wire off from around the mare's tail, and she went to eating grass and drinking some of the milk that had collected in a hole in the road, and they got me home, and I have been in bed ever since till this morning. I came in on the train to see what you would give to settle. I don't want to be hard on any man that is struggling along to build up a business, but it does seem to me there ought to be a responsibility somewhere for such outrages."

The editor looked wise some more, and finally told the man that if he had not paid a royalty for the use of the electric balky horse pursuader he was liable to be arrested by a United States marshal, and taken to New Jersey for trial on a charge of infringement on a patent, and that it would cost him thousands of dollars.

Charles H. Sewall, Henry C. Andrews, and William G. Hosea, of New York, and Harry W. Pope and James E. Browne, of Elizabeth, N. J., are incorporators of the Citizens' Electric Illuminating Company, of Brooklyn, which filed a certificate with the Secretary of State, on the 16th inst. The objects of the company are the manufacture and use of electricity for producing light, heat or power, and as a means of lighting public and private places, buildings and dwellings in the cities, villages and towns within this State, etc. The capital stock is $200,000, divided into 2,000 shares. The company will have a main office in New York city, but its operations will be carried on in Brooklyn.

### Mid-Ocean Telegraphy.

The idea of telegraphing from ships at sea is not a new one, and crops up from time to time. Mid-ocean telegraphing stations have been proposed, and will probably be carried out some day. The chief difficulty in the way of their adoption has hitherto been the necessity of keeping the ship connected by a branch cable to the main cable lying on the bottom, and anchoring her so as to maintain this communication in all weathers and depths desirable. But Prof. A. E. Dolbear has proposed a plan which may render this fixed communication unnecessary. A large metal plate attached to an insulated conductor is lowered from the ship to the bottom on the track of the cable, and another plate is merely submerged. Between these two plates a battery and Morse key is inserted. On working the key the Morse currents induce other currents in the cable, which can be heard in telephones attached to the cable on shore.

### Dr. Meldon's Electric Motor.

The improvements that, from time to time are recorded as made in the electric motor furnish good circumstantial evidence that that ingenious and invaluable invention is but in its first stages of development. Founded upon a correct interpretation of natural laws, every addition to its efficiency places it a step higher on the road to perfection, and the number of intelligent and industrious electricians at work upon it is an assurance that these steps are likely to be in the future as rapid as they are genuine.

Of all the recent improvements made in the electric motor, it is safe to say that that just made by Dr. Meldon, of Dublin, is the most important, for it not only does away with the manifold disadvantages and inconveniences which go hand in hand with the employment of dynamos but also creates the largest amount of driving power with the least expenditure of electrical force. At the start the doctor made use of twelve magnets, but, when the machine was properly tested, the discovery was made that although each of the magnets would lift half a cwt., or attract a heavy iron bar from 1 in., yet the whole twelve, when bound together, would only lift or attract the same weight.

Describing his experience to other electricians and mechanicians, he could not obtain an explanation of this phenomenon, and decided to seek himself for the explanation. It was fortunate that he pursued this course, for it was not long before he made the discovery that the inertness of the magnets was due to neutralization, and that by magnetically insulating the bars with copper instead of iron bolts, and putting a few layers of gutta percha between the bars and the rims of the wheels he could develop full power—a fact which it seems has been hitherto unknown.

The armature of the new machine, as described by the English *Mechanic*, is formed by joining together two 15 in. solid pulley wheels with seven flat bars of iron, each bar being 24 in. long by 3 in. wide and 1½ in. thick, and, as has been observed, the bars are laid upon gutta percha, copper bolts being used to fasten them to the wheels. A shaft of 1½ in. steel passes through the center and the whole is supported by a hard-wood frame, stayed with iron. Each side of the frame where the shaft emerges therefrom is supplied with an ivory commutator, the one on the right having three and the other four brushes, each of which communicates with a magnet.

Attached to the frame are seven electro-magnets and three larger ones, being made of 2 in. soft iron and wound with No. 14 wire without bobbins and the other four of 1¼ in. iron, and wound with No. 11 wire. The total weight, as at present constructed, is a little over three cwt.

The trial of this motor took place in a boat 22 feet long and 5 feet beam. The battery used was one of 36 cells of bichromate of calcium with zincs of 6 in. by 4 in. and carbons 6 in. by 5 in. Half the cells passed through a commutator into one set of magnets (the whole charge going into one magnet at a time) and the remainder of the cells through the other commutator into the second set.

Commenting on this the English *Mechanic* says:

"The great utility of this arrangement was experienced during the trip, as when all the cells were made use of the boat went at full speed, but when only one commutator was employed half speed was obtained, and on a long trip the second battery could of course be recharged. The motor is capable of making about 900 revolutions a minute, but this in the trial trip was reduced to 400, when the boat went over, with a slack tide, nine miles in a little more than one hour, a single mile having been accomplished in seven minutes, and subsequently, when the tide was more favorable, eleven miles were gone over in an hour. A little over two horse-power has been registered from only 24 cells. It is to be regretted that owing to the small size of the launch, the battery, which was placed in the forward portion of the boat, 18 cells being arranged on each side, occupied so much space that there was only room left for four persons to sit with any degree of comfort, and consequently he was obliged to abandon the idea of working his motor with a battery; but, judging by the actual result obtained, he is confident that with *two* storage cells of an accumulator he could easily obtain a speed of over eleven miles an hour.

"The advantages claimed for the motor over a dynamo are—1st. Only $\frac{1}{10}$ of the battery power is required to obtain a single horse-power; 2nd. As there is no dead center it will start instantly, and there is therefore no loss of power; 3rd. The whole force of the battery passes into one magnet at a time, so that very little power is required. It should be remembered that the launch Electricity had forty-five accumulators of the latest type on board, which were calculated to supply power for six hours at the rate of four horse power, the mean speed obtained having been nine miles an hour. Dr. Meldon's had only thirty-six cells, and did a mile in seven minutes, and it should be noted that the battery was nearly exhausted when this trial took place.

"Dr. Meldon's object in consenting to the publication of these details of the motor is two-fold:—First, to place upon record an account of his original experiments for the benefit of those who are interested in the subject of electricity as a motive power; and, secondly, to receive any practical suggestions which the reader of this brief description of his invention may be disposed to send to him."

### The Exhibition at the Smithsonian.

Mr. A. A. Hayes, who is the representative in Washington of the proposed Brush Swan Electric Light Company, gave the first of his formal card receptions on the 10th instant, at the Smithsonian institution. One hundred and forty persons were present, between the opening and the closing, and among them distinguished gentlemen in both the political and scientific worlds, including Mr. Gardner Hubbard and Mr. Bell, of telephone fame; Senator Conger and his son, Postmaster Conger, and their families, John Jay Knox, Col. Talcott, of Richmond, and others.

The Brush storage battery—a long pine box containing twenty-one cells, and these in turn filled with a weak dilution of sulphuric acid and lead plates, was connected with the incandescent lamps by long and easily-traced wires. Thirty or more lights were kept burning for two hours—the supply being entirely drawn from the storage battery—all the wires leading to the battery having been disconnected. Each of the lights was provided with a stopcock, and the flame or incandescence turned on and off at pleasure. Every variety of burner for house or interior lighting was shown, but the one most admired was a desk lamp similar to a gas portable desk lamp, which could be moved from place to place as required.

It would be impossible to say too much in the way of praise of the quality of the light, its purity, softness, and regularity. There was not the slightest flickering or unevenness about it—the flame, if such it may be called, burning steadily as the electricity which created it flowed in an even and noiseless current from the battery.

There were very many pretty features of the exhibition, such as the attachment of Mr. A. G. Foote's fan motor and its operation by a small wire run to the battery; but the main objects of interest were the battery and the light, and these were admired by all. Every night during the week the exhibition will be continued, the battery being charged during the day by the same dynamo from which the arc lights are maintained, and both being in operation at the same time.

The London *Telegraph* thinks that the time is not far distant when every nightfarer will carry his own ray of electricity about him, enclosed within the compass of a machine not larger than the watch now ticking in his pocket.

### The Electromotive Force of Batteries.

*Engineering* says that the electromotive force of "single electrolyte" batteries varies with the form of the electrodes, the working of the battery, and so on. It is therefore desirable to know its maximum and minimum values for a given combination. M. Emile Reynier, the well-known French electrician, has devised a means of measuring these, which is worthy of attention. He has formed two model forms of standard cell, which can be fitted with different metals and electrolytes at will, so as to get results for different combinations. The one for giving maximum E. M. F. results consists of a negative electrode of copper made in a plicated form, and giving 300 times more surface than the positive electrode which is a wire of zinc three millimeters in diameter. The minimum cell has its positive electrode, a wire of copper five millimeters in diameter; and a hollow cylinder of zinc forms the negative electrode. The minimum E. M. F. is measured by short circuiting the cell for several hours, and then taking its difference of potentials. This reduces the products of oxidation formed by the air which in any case are very small, owing to the small surface of the negative electrode. With cells of this sort M. Reynier found the maximum E. M. F. 1.072 for a couple of amalgamated zinc and copper in dilute sulphuric acid (two volumes monhydrated sulphuric acid to 1,000 volumes of water) to be 1.072 volts, while the minimum was 0.272 volts, a very considerable reduction. Similarly with ordinary zinc instead of the amalgamated in the same combination, the maximum E. M. F. was 0.94 volts, and the minimum 0.194 volts. With ordinary zinc and iron for the copper the difference was less marked, the maximum being 0.429 volts, and the minimum 0.309 volts.

The Chicago Anderson Pressed-Brick Company have recently had placed in their works in Chicago a twelve-lamp electric light outfit.

The Chicago and Northwestern Railway Company are making preparations to have their large and elegant depot, corner Wells and Kinzie streets, Chicago, lighted by electricity.

The Pullman Palace Car Company is making preparations to fit up all of the palace cars turned out at their works in the future with electric bell apparatus.

The apparatus for each car will be complete in itself, with its own annunciator and battery, and a push button for each sleeping berth, etc.

The company turns out an average of one complete car per day.

They have some thoughts of fitting up the cars already on the road, also, with this apparatus.

The adoption of this apparatus will, of course, add much to the comfort and convenience of these model cars.

### The Magnetic Pole.

Professor Thompson, in a lecture at Glasgow, stated that the magnetic pole is now near Boothia Felix, more than 1,000 miles west of the geographical pole. In 1657 the magnetic pole was due north, it having been eastward before that. Then it began to move westward until 1816, when the maximum was reached. This is now being steadily diminished, and in 1976 it will again point due north. Professor Thompson says that the changes which have been observed not only in the direction but in the strength of the earth's magnetism, show that the same causes which originally magnetized the earth are still at work.

As the lightning on the edge of the clouds, so the free traders with dagger and lighted torch, hover around the outskirts of industrial affairs to single out one by one the weak and undefended industries, to murder and destroy them.

An idea of what free trade has done for England is shown in the decline of the silk industry, more than one-half during the past twenty years, being driven out by the competition of the higher art of Germany and France. What protection has done for America is also shown in the growth of the silk industry, from merely nothing twenty years ago, to a position only third in the world's production at this time. The following table shows where silk is made:

| | |
|---|---|
| France | $85,000,000 |
| Germany | 45,000,000 |
| United States | 35,000,000 |
| Great Britain | 25,000,000 |
| Switzerland | 18,000,000 |
| Russia | 16,000,000 |
| Austria | 12,000,000 |
| Italy | 15,000,000 |
| Japan | 5,000,000 |
| Other countries | 17,000,0 0 |
| Grand total | $270,000,000 |

The new railway track laid thus far this year has never been exceeded but twice. The laying in several years was as follows:

| | Miles. |
|---|---|
| 1883 | 5,819 |
| 1882 | 9,255 |
| 1881 | 6,983 |
| 1880 | 5,443 |
| 1879 | 3,263 |
| 1878 | 2,126 |

The Union Foundry and Pullman Car-wheel Works, Chicago, are soon to be lighted by electricity.

It is estimated in the *Engineer*—but the sources of information are not given—that the world's stock of locomotives consists of 66,000; of passenger cars, 120,000, and of freight cars, 550,000. The capital invested in railways, which are in all 200,000 miles long, is £4,000,000,000. The commerce of the sea is carried by 12,000 steamers and 100,000 sailing vessels, whose tonnage amounts to over 20,000,000 tons.

The total imports of wood and manufactured wood for the last year, reported, was $13,532,604. Of this there was for boxwood, $48,991; cedar, $330,062; ebony, $72,344; granadilla, $3,111; lancewood, $10,634; lignumvitæ, $60,839; mahogany, $569,412; rose, $260,757; sandal, $702, and all other woods, $315,410.

In 1883 the Government paid the railways for mail transportation the sum of $12,753,184; in 1883, $13,887,100. The decrease in the cost of the entire service, steamboats and otherwise, has been $814,871, with an increased mileage over 1880 of 1,927,827 miles.

The Russell Paper Company, Lawrence, Mass., do not propose to be obliged to shut down by short water the coming year, and have ordered three more Armington & Sims Company engines, making eight in all used by this company.

### Economy of Heat.

The plan of heating the air needed for combustion, and known as the regenerative plan, invented by Siemens, has successfully been applied to iron and steel furnaces, and lately to gas-burners and common domestic grates. The waste heat of the fire or lamp is used to warm the air needed for combustion, at a very great gain in the amount of heat or light obtained from the fuel. A later improvement, by the addition of steam power, brings the regenerative system more directly and thoroughly to ordinary stationary boilers, at an undoubted economy of fuel.

Upon the top of the boiler at the rear, next the chimney, are placed two blowers to be driven by steam power, the "Root" pattern being suggested as the best.

The products of combustion pass from the fire-box under the boiler to the rear, and return through the tubes to the front. At the top of the boiler casing, and extending backward to the chimney, is a flue divided into a number of small tubes by partitions.

The best thing it can be likened to is a surface condenser, for through half of these tubes flow the products of combustion toward the stack, and through the other half flows the air needed for combustion.

The blowers each control one of these currents, as the cold-air current would require some pressure to drive it through the pipes that are heated by contact with the smoke pipes. The cold-air pipes are carried downward into the ashpit to assist combustion, and to openings over and behind the fire. The smoke and flame drawn through the small tubes by the blowers, impart their heat to the air passing downward through the adjoining pipes, so that it enters the fire at a high temperature.

This is a great gain, for more heat is obtained from a given amount of fuel when the air needed to make it burn is heated than when it is cold. The heat thus saved would be, in the ordinary furnace, totally lost by escape up the chimney.

The invention would seem to be an improvement over any regenerative system that has been applied to steam boilers. At the same time, it might be suggested that a double stack, or a chimney having two divisions, each filled with fire-brick loosely laid in, would probably be better. The product of combustion could be sent up one stack till it was well heated, and thence directed into the second stack.

The air for combustion could then be taken downward through the hot brick-work, precisely as in the regenerative furnace.

As far as can be learned, no experiments have yet been made in this direction; but there is reason to believe that such are soon to take place in Pittsburgh.

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A reduction of ten per cent. went into effect on the 10th of December and has been announced in the wages of the "ton" men, at the New Jersey Steel and Iron Works, in Trenton. The "ton" men include puddlers, rollers, and heaters, who number a couple of hundred, and whose wages range from $2 to $4 a day.

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"Inch by inch" is the policy which the free traders propose in their tariff schemes, cutting off a piece at a time, so as not to shock the country, but so as to keep business in perpetual hot water. But it is not so much what is actually done as in unsettling the business by a continual agitation.

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Messrs. B. W. Payne & Sons, manufacturers of the well-known Payne high-grade automatic engine, have removed their entire business from Corning to Elmira, N.Y. The demand for their engines from electric light companies and others rendered their works at Corning inadequate. At Elmira, with increased facilities, they hope to be able to fill all orders promptly. Electric light men who have used the Payne engine speak of it in the highest terms, and we are glad to see that the manufacturers are now getting into position to turn out the engines with sufficient rapidity to supply the growing demand.

### Mexican Life, Incidents, and Political Situation.

CITY OF MEXICO, Oct. 1st, 1883.

But very little has been written about Mexico that is true. As a rule, writers try to do their best to smooth over facts that ought to be known, and it is my intention to give a true and correct statement of life, commerce, and the political situation, with names of the cabinet officials of this country.

Vera Cruz: A name well known to all educated Americans, and a most attractive and lively city as there is in the Republic of Mexico. A word to tourists before giving a description of the city and its attractions and places of interest: A tourist arriving at the Custom House at V. C., finds the officials exceedingly polite, so much so, that they are inclined to allow them to put their hands in their pockets and take all the money they wish; and my advice to all persons arriving at that haven of rest, in the language of the genuine Mexican is, Cuidado Amigo. The best and safest time to visit this place is in the months of January and February, as the sanitary condition of V. C. at any other time of the year is very poor. At this place we find a very fine Theatre Plaza and only a few churches, which is a godsend to the people; and this is the difference between V. C. and the majority of other cities, as the rest have churches for every two thousand inhabitants, and the people are very fanatical, and fanaticism is sure death to commerce and independence. A band of music plays every evening in the Plaza. V. C. is noted for its (Bonitas y instruedas mujeres). On the outskirts of the city are some very fine orange and banana plantations, and it will pay any one to take a picnic for a day to those places, and smoke Vera Cuizian cigars

Leave V. C. by Mexican National R. R., and pass through a most delightful and attractive country as there is in the world. Pomegranates, figs, oranges, bananas, and all imaginable flowers growing in abundance. The works of nature in this part of Mexico are wonderful, and it is impossible to give a description that will convey the least idea of its beauties. Arriving at Orizaba, we conclude to stop and visit the noted pleasure resort city of Mexico. All day we stop at our hotel and rest. In the evening we go to the theatre—a very fine building, and a credit to the builders. We had the pleasure of hearing a play in verse, called a' las nuevi de la noche. In the morning we were awakened by the ringing of about five hundred bells, and that is only one-third of the number that are in this place. Here is where fanaticism shows itself. There are about 65,000 inhabitants, and 40,000 are peons. All the peons are under the finger of the priests, as are also the majority of the better class; and writers giving a description of churches tell of the images of gold and silver that are in the churches. In comparison to the Catholic Cathedral of New York, the churches are like a ten-story tenement in Mott street. At 7 A. M. we started for the snow-clad peak of Orizaba, and it is a journey that will pay any one to take; and as we arrived at the top on burro-back, we imagine that we are in the northern part of the U. S. Coming back, we passed through a small pueblo, and saw a procession that disgusted and surprised us. About 5,000 peons, and it is almost impossible to say how many priests, had an image of Jesus Christ strapped on horseback, and dressed up like Buffalo Bill, with a large hat, rifle, two revolvers, and two table knives stuck in a belt around his waist, traveling through the streets, and the motley crowd singing "Jesus Christo y Santa Maria."

Arriving at Orizaba at 7 P. M., we packed our goods and got ready to start at 10 A. M., next morning for City of Mexico; and as we got into our beds to spend another pleasant night with fleas and bedbugs, we were all of the same opinion, that Orizaba has some very fine buildings and plazas, but the people are very ignorant and fanatical.

Next morning started on our route to the City of Mexico. We passed through a very fine country, and very luxuriant, and concluded to visit Puebla de los Angelis, "Village of the Angels." This is a very fine city of about 85,000 inhabitants. And here we noticed the first American enterprise, the Telephone Company, and we had the pleasure afterward to make the acquaintance of the general manager of the company, Mr. W. E. Huntington. And here we must say that we are inclined to believe that the only invention that will ever take in this country is the telephone, as it allows the priest to call his flock to church when he is inclined so to do. Pueblo has some very fine places of interest, San Francisco Park, Theatre Plaza, and one enjoys a ride on the outskirts of the city very much. Here we notice a little more civilization, as the Mayor of the city has issued an order that all persons will be compelled, after date May 14, 1883, to wear pants in the streets of the city, instead of cotton drawers.

Leaving Pueblo next day, we are on our way to the City of Mexico, and the pride of the Mexican heart. Arrive at Mexico at 8.30. Here we experience a pleasant surprise—the electric light—and as we took a coach to the Hotel Iterbide we were at last convinced that we had got into a little civilization. Next morning started on a tour through the city, and enjoyed ourselves very much. Mexico is very different from any other city in the Republic. All the buildings are high, and well made. Business is very brisk, and at every hand we see the magic touch of the enterprising American. Places of interest are Chapultepec, National Pawn Shop, Theatres, and Government Buildings.

The commercial condition of Mexico is very bad. As there are no manufactories worth mentioning in this country, naturally all goods are of foreign manufacture, and they are sold at an enormous price. It is not the fault of the merchant, as he sells goods at little or no profit. The Custom House of Vera Cruz being the principal one, and also the principal seaport city, most goods enter there from England, France, United States, Spain and Germany. The duties are enormous. This country also has a State and city duty. By the time the merchant gets his goods from Vera Cruz to City of Mexico he finds that he has to sell them at a very high price, or close his business; and a merchant's advertisement never says that he can sell less than others, because all have to pay alike, and all sell the same. A merchant buys goods from a wholesale house in Mexico. He has to pass them through the State custom house, and pay State duty. That merchant sells to another in the same State. The goods have to pass through the city custom house and pay duty, therefore the merchant has no out of town trade; and who is the sufferer? The fourth purchaser and consumer. A farmer, for instance, brings his poultry to sell in the city, and for every head that enters he has to pay a medio (six cents), Therefore, again the purchaser and consumer are the sufferers. To give an idea what duties are at Vera Cruz, for every wagon or carriage wheel that enters this country, $50 is the duty on every wheel, and all other goods are in proportion. The poor man, therefore, cannot buy these things, as he only gets twenty-five cents to fifty cents a day, and that is paid with miguel coin, on which there is a discount of six per cent., and we hear on every hand complaints, of which we are not surprised. But we hope that the Congress, at their next sitting, will remedy these things.

The political condition of this country is in a worse state than the commercial. As in all Catholic countries, the people are controlled by the Church, but here the Church does not recognize the Government, nor the Government the Church. The majority of the people are of the lower class (called peons), and they are under and controlled by the Priests. For every man who wears a coat in this country, there are 5,000 who do not; and those and a great number of the others, are on the side of the Church, and we are afraid that within a very few years Mexico and its independence will be a thing of the past. But the intelligent Cabinet the President has, consists of some of the most educated and talented men of this country. Minister of Government, Carlos Diez Gutiernez; Of Relations, Ignacio L. Vallarta; Interior, Carlos Pacheco; of War and Navy, General Naranjo; de Hacienda, Jesus Fuentes y Muñiz, and they ought to see, and remedy to the best of their ability. And as we leave the City of Mexico to start on our travels, we all wish long life and peace to the Government and its President, Manuel Gonzalez.

G. W. E.

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In April of last year the work of electric communication was inaugurated. The main line of the railroad company from Kaiping to Tientsin, 99 miles, was completed as far as Lutai, a distance of 30 miles from Kaiping, in October, 1882. The remainder is to be finished early in the present season. This line will include five stations, all being on the company's line of coal transit; the approximate cost of line being $100 per mile. The poles are 28 feet in length, of Foochow wood; the wire B W. G. 8 English; insulators are of English make. This line is to be used in connection with telephones for way stations and telegraph for the termini. The telephones are of the Bell-Edison system; the telegraph on the American plan (closed circuit).

The line follows the railroad, Lutai canal, Pe-Tung river, Ku-tung canal, and the Peiko river to Tientsin. For twenty-seven miles the wires are hung on the poles of the government lines. The local communication of the company comprises six telephone lines centered in exchange at the main office of the works. These lines are of the average length of about one-half a mile each. System the same as on the main line. These various lines were constructed and are under the management of Prof. E. K. Buttler, of Ohio, the electrical engineer. The labor used in the construction and maintenance of the lines, including operators, being Chinese.

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Lincoln, Ill., is taking steps towards the introduction of the tower system of electric lighting. This is the system which has lately been put in operation in Elgin, Ill., causing that city to be declared "the best-lighted city in the world."

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The newest swindler discovered is a girl. She was in a telegraph office writing a message. She wore mourning clothes, which were strikingly neat and cheap. "Will you please tell me," she said to a bystander, "how I can condense this message to ten words? I don't wish to have to pay anything extra." This was what she had written on the blank: "I am friendless here; I have only a dollar left. Send some money." The unimpressionable narrator looked her squarely in the face, and found it charming, but not to a delusive degree. The pallor was artificial, and the dolorous expression was mimicry. Every day for a week she had written that same message, without ever sending it over the wires, but with more or less success in exciting lucrative sympathy.

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### Heathen Chinee Telegraph.

Owing to the peculiarity of the Chinese characters, each of which represents a word, not a letter, as in our Western tongues, the Danish Telegraph Company (the Great Northern) working the new Chinese lines have adopted the following device. There are from 5,000 to 6,000 characters or words in the ordinary Chinese language, and the company have provided a wooden block or type for each of these. On one end of this block the character is cut or stamped out, and on the other end is a number representing the character. The clerk receives a message in numbers, and takes the block of each number transmitted and stamps with the opposite end the proper Chinese character on the message form. Thus a Chinese message sent in figures is translated into Chinese characters again and forwarded to its destination. The sending clerk, of course, requires to know the numerical equivalent of the characters and have them found for him.

# Telephonic News

There is at the present time a great newspaper outcry that the electric wires "must go" underground.

The same cry has been maintained with more or less persistence and intensity now for a long time, and while on the part of the daily press there can be no doubt that its constant repetition is honestly based upon a supposed necessity and feasibility; there can also be no doubt that it would not be reiterated with such vigor and violence were it not for the desire of certain newspapers to appear as the advocates of the will of the people, and so to increase their own popularity at the expense of the electric companies.

Furthermore, it is but too evident that the so-called spontaneous movement was first set afoot, and then vigorously promoted by interested persons, who have themselves laid a few wires underground with a limited degree of success, and at an unlimited expense; and who now desire to force their business rivals into the same expense, in the hope that while the change is in progress, the field can be taken possession of.

Still another class of persons are also deeply interested in desiring that the electric companies be forced to bury their wires: these are the professional inventors, and owners of patents for so-called underground wire systems.

If the first only, the inventors, were to be considered, we could afford to have more sympathy for them than we have, but the fact is not so: Most of the inventors are poor, but honest and well-meaning persons who devise some minor improvement, and patent the same in good faith. Too frequently, however, the inventor disposes of his invention to a group of speculators, who form a stock company, lay half a mile of troughing, or a metal covered cable in the city streets, show a telephone line working over one wire, a Morse telegraph on another, and an electric light over still a third; and get a couple of affidavits from experts, to the effect that the above wires worked harmoniously and without interference with one another; after which the stock of the underground company is boomed to 99, the majority of it sold as a great favor to the wool-bearing fraternity, the promoters get out, and the curtain drops on the unfortunate company.

As is well known, the New York *Times* has been one of the most strenuous advocates of the burial business.

The Boston *Evening Transcript* also evinces a desire to render itself notorious in the same direction, and many other newspapers join in a similar cry, that the wires, telegraph, electric light, and telephone must all go underground, to work if possible, but underground in any case, work or not.

Many of the articles to which we diurnally are treated are really so ridiculous, and evince such an utter degree of ignorance concerning the subject in hand, that we are forced to believe in the doctrine of inspiration, and to regard the said article as the ravings of an inspired idiot.

Any one really understanding the merits of the case, is tempted to paraphrase Gilbert, and think, if he does not say,

"And while the daily press withholds
Its mischief, making hand,
And editors resist the itch
To interfere with matters which
They do not understand,
Then telegraph and telephone
Will do their work without a groan—
But newspapers were never prone
To let the 'well enough' alone."

The objections brought against the aerial wires are various and on entirely different lines.

We hear that they are unsightly; they offend the æsthetic sense of the age; they are dangerous, they are liable to fall and hurt people; and in case of a cross they are apt to deal death and destruction to any and all who cross their path.

They obstruct firemen in the execution of their duty, etc.

Considering these points, it will be readily conceded by any one, that there is no beauty about the electric wire, its posts, poles and fixtures. Nobody, so far as I know, ever claimed that there was; that is, with the exception of a certain symmetrical beauty inherent in, and therefore inseparable from good workmanship, wherever it is found.

But because the well-built and well-nigh indispensable telegraph line does not convey to the brain the restfulness, and reposeful beauty of a lily, or of a beautiful painting, is it therefore to be condemned out of hand as a cumberer of the ground, and sentenced to be buried alive?

Is every useful thing ornamental? Can we not assert with truth that general utility and beneficence makes the most repulsive appliance of life beautiful? What but the electric wire has made the Press itself the mighty engine for good and evil it is to-day? What but the electric wire and its electric sister arts, has made the present age, the age *par excellence* of the world?

If everything that is not beautiful to the eye must be banished below the surface of the earth, why not make a clean sweep of it; and banish at once, the locomotive and its train; the elevated railroad; the carts, wagons, and cars that throng Broadway, and so on through the non-æsthetic list.

But the electric wires are dangerous. So is a dog, if he bites; so is a railroad when the locomotive boiler bursts, or when a train runs off the track; so are many other things if they are handled the wrong way. But we don't want to abolish them for that reason. But it is said, the electric light wires will cross with telephone wires, and carry the death-dealing current into our houses. Yes, and therefore we want to put *all* the electric wires without discrimination underground; where they will again be in juxtaposition.

To be consistent, why not advocate the placing of some of the electric systems under the surface of the earth?

But we hear that the work of firemen is hindered by the wires. Is it? Who says so? The newspapers. What gives the alarm to the firemen? What tells the firemen of the fire and where it is? The electric wire. Yes; so it appears that with all the evil the wires do, they occasionally do a little good.

Now the object of the writer is not to argue the impossibility of placing all electric wires below the earth's surface. He does not believe in impossibilities. He thinks it perfectly possible, and even believes that many classes of electric wires should be conveyed in subterranean conduits.

Yet there seems to be a wide gulf between the words "possible" and "practicable," and another, almost as wide, between the words "practicable" and "practical."

The fact that it is possible to bury the wires does not necessarily imply that it would be practicable to work them as well, or that any practical system of subterranean organization has yet been provided.

It is argued by the agitators, and with reason, that, on economical considerations, it is the interest of the electric companies to get the wires underground as soon as possible, because they are always in danger of destruction by the storms of winter.

Is it to be supposed that the said companies do not recognize this fact, at least as clearly as the professional grumblers who harp thereon? And, when recognized, is it again to be supposed that when a good, or even a presumably fair, method is provided, they will not use it for their own protection?

This is evidenced by the expensive trial system of the American Bell Telephone Company in Boston, and by the work of the Western Union Telegraph Company in New York, between 195 Broadway and their Broad Street office, and also by their system now under construction between 195 Broadway and the new building on the corner of Fifth Avenue and Twenty-third Street.

I do not think any electric lighting company cares to deny that their wires will successfully work under ground so far as electrical considerations alone are concerned; or that the difficulties in the way are mechanical alone. It does seem to me, however, that the chief deterrent consideration is the fact that there are many companies, and that, unless some harmonious action is maintained between them, so that one channel in a street may serve for all, they will be apt to keep a street constantly in a state of volcanic eruption, and so drag down upon themselves the fearful indignation of the ever-watchful newspaper and the "Constant Reader;" so that, in attempting to avoid Scylla they will be engulfed in Charybdis, and the last state of that company shall be worse than the first.

Local telegraph wires can also be carried underground without any great difficulty—that is, without any great electrical difficulty—provided that no faster system than Morse is used, and that the lines are of no great length.

But that long wires can be worked under ground *with the same speed* as they could be aerially, I utterly deny, and am perfectly sure that my denial will be endorsed by any practical telegraph engineer that knows anything. Furthermore, when fast systems are used, such as the Rapid, or Wheatstone automatic, the inductive embarrassment becomes quite pronounced, and acts literally as a brake.

One of the most interesting of the many interesting habits of the would-be scientific section of the daily press, is that of stating the amount of telegraph wire mileage laid underground in England, France, and Germany, and then, in a way that savors of flippancy, reflecting upon the blindness of American electricians in neglecting to follow this example.

The following extract, for instance, is from the Boston *Transcript*, and forms a fitting doxology to a long column of vituperative advice:

"The moral to be derived from all these facts is this: Ignorance being, as alleged, a prevailing characteristic of American electricians, patriotism should no longer hinder the exercise of economy among the telegraph companies, which will find that the cheapest plan to adopt will be to import a score or two of English, French, or German electricians, to teach us how to lay wires underground."

But it is to be regretted that, in citations from the European statistics, the whole truth does not always appear.

The French system is undoubtedly a slow one, and Frenchmen, as a rule, do not care for any great rate of speed in business transactions; moreover, the telegraph is not used in that country to anything like the extent to which it is in this country and in England, hence the Morse system, and that worked at the slow rate enforced by the buried wires, can suffice.

In Germany, the underground system of cables is an auxiliary to the aerial system, and is confessedly a military series of lines, buried for security. Speed in these, then, is not required, and is not attained, as we know from the statements of German State officials.

In England, it is true that many of the telegraph wires are in cities buried in tubes, and that they are thus out of the way; yet hear the statement of Mr. W. H. Preece, a gentleman of the highest reputation as an electrician, and holding one of the highest positions in the British telegraph service; lecturing before the Society of Civil Engineers in February, he says: "There is a great cry for more underground work in England, owing to the destruction to open lines by gales and snow storms; *but underground telegraphs, wire for wire, cost at present about four times as much as overground lines, and their capacity for the conveyance of messages is only one-fourth; so that overground are commercially sixteen times better than underground wires.*"

Coming now to telephone wires, there is little to tell save the oft-repeated story of dynamic and static induction, with their phenomena of transferring messages from one line to another, and retardation of messages; the latter, unfortunately, being increased by the methods employed to decrease the former. This subject is so exhaustive as to demand a special article, and it will therefore suffice here to say that there is no system of laying telephone wires underground in which the latter harmful effect does not appear to a greater or less degree; less, when the lines are short and worked locally—greater, when they are in themselves long, or worked with long ones. I am fully aware of the much-cited Parisian telephone systems; of the fact that the Paris wires are *all* below the surface. Let the cities that desire to have their wires buried build such spacious subways as we find in Paris, and then pass laws and statutes whereby the wires may be suitably placed therein. The wire owners will gladly co-operate to this end, as the existing combination of companies to find a feasible plan in New York proves.

Let the subway be large enough for wires of every class, with a great space between them. Let it also be spacious for gas, steam and water pipes, and for all other systems of municipal convenience.

These ways would be expensive, but would soon pay for themselves, and we may rest assured that this only is the true way to meet the emergency. Cities which have provided these ways may consistently compel the wire owners to occupy them, but it is not saying too much to say that no city of this great country can afford to say, "Go underground or stop work." What if the companies controlling all the electric agencies should elect to adopt the latter alternative? T. D. L.

---

We learn from several subscribers to the *Telephone Exchange*, of this city and Matamoros, that during the performance of the Operetta, "Doctor of Alcantara," at the opera house, on Saturday evening, Mr. Oswald Wilson, manager of the *Exchange*, obligingly connected them with telephones he had placed in the opera house, and they were thus enabled to hear distinctly, not only the music and singing, but understood the conversation, and even recognized the voices of the speakers. At Mr. Brulay's sugar plantation, nine miles below town, the performance was heard perfectly, and had Pt. Isabel been connected with the *Exchange*, the residents would have been treated to something new, for this section—indeed, we may say for the State of Texas, as we learn that this is the first time the telephone has been put to such a purpose in Texas. Brownsville and Matamoros are not so far behind as they might be. The reserved seats to this long-looked-for performance were sold at an early date, and we doubt not that many persons, who had looked forward with pleasant anticipations to attending, had been obliged to remain away from inability to procure seats; others, especially persons from Matamoros were unable to attend from the inconvenience occasioned. To these the telephone has been a source of great pleasure. Great credit is due to Mr. Wilson for his endeavors to oblige his subscribers, which have certainly met with most happy results. A telephone transmitter was placed on either side of the stage, about five feet from the board, and another placed on and in front of the stage, just behind the footlights. The three were then connected to one wire.—*Brownsville News.*

---

The Empire State Telephone Company have just built a new trunk line from Auburn to Ithaca *via* Cortland, N. Y., and also connect at the latter place with N. Y. and Penn. Tele. Co.'s system.

---

Mr. James C. Kenny has been appointed supply agent for the Central Union Telephone Company, the appointment to take effect December 15, 1883. In addition to the duties of purchasing agent of the company, he will have charge of the company's Chicago warehouse, and of the disposition of surplus apparatus, supplies, and material at all points within the territory of the company. This is a deserved promotion.

The Cumberland Telephone and Telegraph Company expect to have twelve hundred subscribers connected up at their Nashville exchange by next May. They put in forty new telephones in November, and expect to put in fifty this month, in this exchange.

The increased amount of toll-line work being done by the telephone companies having made something of the kind necessary, Mr. A. S. Hibbard, superintendent of the Wisconsin Telephone Company, has invented a time signal for toll lines of telephone exchanges.

Heretofore it has been necessary for the toll-line operator to make out a ticket, noting the time at which a conversation is begun, and then keep the matter in mind so as to be sure and disconnect at the proper time.

This works very well as long as the connections required are very few, but when several persons require the toll service at the same time confusion is likely to arise.

Mr. Hibbard's invention consists of a time-piece and mechanism, by the use of which a single operator is enabled to make the connections and disconnections of toll lines promptly and without confusion; the time apparatus automatically signaling him when the proper time to make the disconnection arrives.

The new telephone list is an indication of the enterprise and business of Nashville; the city and connections show over fifteen hundred subscribers, while the city proper has nine hundred.

The following have been elected officers of the Commercial Telephone Company of Troy, N.Y., Gardner Earl, president; John F. Porter, vice-president; A. N. Belcher, secretary and treasurer. Directors: Gardner Earl, George P. Ide, C. A. Tinker, A. N. Belcher, John F. Porter, F. W. Sabold, W. O. Humstone.

### Pittsburgh Patronage of the 'Phone.

In conversation with a local newspaper man, one of the chiefs of the Pittsburgh (Pa.) *Exchange*, stated recently that there are about 1,400 telephones in use in that city, on 982 wires, at a charge ranging upward from $7 per month, according to the length of the line. The longest circuit is that extending from Pittsburgh to East Liverpool, a distance of forty-six miles; and connection has now been made with Wheeling, W. Va., as mentioned last week. The exchange also communicates with Steubenville, O., Beaver Falls, Rochester, McKeesport and Mansfield, Pa. The superintendent is Mr. H. Metzgar. The day force is composed of thirty-two persons, and the night force of seven. Very little work in proportion, is done after dark in Pittsburgh.

The Tropical Telephone Company have shipped 2,200 sets of instruments for use in their South American territory within the past six months.

### Telephone Interference Cases.

WASHINGTON, D. C.—The arguments by counsel for Voelker & Irwin, Alexander Graham Bell, Thomas A. Edison, Gray & McDonough, parties to the celebrated telephone interefence cases before the board of examiners-in-chief of the Patent Office, were concluded the 15th inst., by Roscoe Conkling. The decision of the examiner of interference was in McDonough's favor. An appeal was made from this decision by Voelker & Irwin, Bell, Edison, and Gray to the board of examiners-in-chief, who have spent the past week in listening to arguments by their counsel.

### It Has a Soul.

It is often said, with much truth, that "corporations have no souls," but one here in Harrisburg has. The Pennsylvania Telephone Company of this city gave $50 to the relief of the people burned out of home at Shenandoah.—*Harrisburg Sunday Telegram*

### The Mystic Telephone.

BY J. A.

As I sat the other evening,
In the office, all alone,
There came a softly tinkle
On the "Empire" telephone.

I took it from its silent hook
And placed it to my ear—
This was the tender phrase I heard:
"Oh, you're a little dear."

I smiled to think that something rich,
Perhaps, I'd tumbled on,
To drive away the dismal thoughts
That me had fell upon.

He whispered of his burning love,
His hopes, his doubts, his fears,
Since last they met. The hours to him
Seemed like so many years.

He kissed her through the telephone,
To him a novel way.
She said it wasn't half so good
As in the old hall-way.

Just then there came a bold "Hello!
Will you pair ever go?
I've waited here for half an hour,
Trying to get a show."

A clicking sound, a mild hello!
"Why, what's the matter here?"
I knew it was the central switch
By Ella's voice, so clear.

As this appeared a serious case—
I hardly think 'twas fair—
This sordid wretch should interrupt
This pining, love-sick pair.

And then again, to think that I
Was left out in the cold;
For Ella switched the wires round,
And I was nicely sold.

Auburn, N. Y.

### A Sleeping Man at the Telephone.

A young man of steady habits, who has been working at his trade of wood-turning at Newport, arrived at his home late at night. After retiring he dreamed that the telephone bell rang, and he stepped to the instrument to reply. He put the cup to his ear and called (Ben Butler style): "Hello, central. What's the matter? Be you all asleep?" Just then the clock in his room commenced striking, which caused the young man to wake up. He was sitting up in bed with one of his boots in his hand, holding the open end of it to his ear.—*Ex.*

### Compania Telefonica de Guadalajara.

GUADALAJARA, Mexico, Nov. 23d, 1883.

*Editor Electrical Review.*

DEAR SIR,—In the ELECTRICAL REVIEW of Oct. 4th, I notice an item stating that the Guadalajara Telephone Office was robbed of a large sum of money. The facts are as follows: A young Mexican, at that time in the employ of the company, and during my temporary absence, forced open a drawer in my desk, and stole a collection of Mexican coins amounting to about ten dollars, besides several other articles belonging to me. The company lost nothing.

Truly yours,
D. J. HOBART,
General Manager.

The Cumberland Telephone and Telegraph Company find it necessary to put another cable across the river at Nashville, their present cable being full.

It is a sight worthy of an artist's crayon to see a woman, while talking through a telephone to her grocer three miles away, stamping her little foot and shaking her fist as though the poor man was quailing right before her.

A lady and gentleman accidentally touched each other's feet under the table. "Secret telegraphy," said she. "Communion of soles," said he.

We publish herewith some further items of interest concerning the New Cable.

CERTIFICATE OF ASSOCIATION OF "THE COMMERCIAL CABLE COMPANY."

Under and by virtue of the laws of the State of New York applicable to corporations of the kind hereby formed, and particularly by virtue of an act of the Legislature of the State of New York, entitled "An Act to provide for the incorporation and regulation of telegraph companies," passed April 12, 1848, and the various acts amendatory thereof and supplemental thereto, the undersigned do hereby certify that we have associated ourselves together as a body corporate for the purpose of establishing, owning, controlling, constructing, purchasing, leasing or otherwise acquiring, using, operating and maintaining a land and submarine line or lines of electric telegraph, partly within and partly without the State of New York, as is hereinafter described and provided. And the said company hereby formed assumes for itself all of the rights, powers, privileges, grants, franchises and immunities conferred by every act of the Legislature of the State of New York applicable to corporations of the kind or class hereby formed, as well also as those granted by the Congress of the United States and by the other States and countries.

The undersigned do further hereby testify as follows:

I.

The name assumed to designate this corporation and to be used in the business and dealings thereof, and by which it may sue and be sued, is "The Commercial Cable Company."

II.

The general route of the line or lines of telegraph of this association and the points to be connected therewith are as follows:

From the city of New York by one or more routes to a point on the sea at or near Cape Ann, in the State of Massachusetts, and thence through the New England States, Canada and New Brunswick, or through such of said countries as may be found to be convenient for the use of said lines to a point at or near Dover Bay, in the province of Nova Scotia; and also by direct lines from New York to Canada, and thence to Dover Bay, aforesaid, and in both cases there to connect with one or more of the submarine cables of this company to connect with the places hereinafter mentioned. And also from some eligible and convenient point on the Atlantic coast, near Cape Ann, in the State of Massachusetts, by submarine cables—one or more as may be found necessary—to Ireland, England, France, Belgium, and Spain, or to any one or more of said countries, with intermediate stations, if required, at all or any of the islands in the Atlantic Ocean. And also a land line or lines from a point on the coast line of France, at or near Havre, to the city of Paris, and also a line or lines from the city of New York through the seaboard, Atlantic and Gulf States of the United States, and from any one or more of said States by a submarine cable or cables to all or any of the West Indian or other islands in the Atlantic Ocean, and to the main land of South America, at such places as may be selected for this purpose, with offices, if required, for the transaction of business at all intermediate points and places.

Also a line or lines from the city of New York through the United States and the Territories thereof to one or more points in the Republic of Mexico, with offices, if required, at all intermediate points, and by another line or lines to one or more points or places in California or Oregon, or either of them, with offices for business if required at all or at any of the intermediate points and places.

And also from one or more points on the Pacific coast of the United States to Japan, China and Australia, with intermediate stations.

The said company hereby formed has and under the acts of the Congress of the United States hereby assumes to itself the right to construct, maintain and operate said lines of telegraph through and over any portion of the public domain of the United States and over and along any of the military and post roads of the United States which have been or may hereafter be declared to be post roads of the United States, and over, under and across the navigable streams and waters of the United States, and all other rights and privileges given and granted by the acts of said Congress of July 24, 1866, and February 20, 1857, and by the Revised Statutes of the United States, title LXV., entitled "Telegraphs." And the said company likewise claims the right to use all of its said lines as telephone lines, and to become the owner or licensee of all or any patents for invention connected with telegraphy or telephony.

III.

The capital stock of this association shall be four millions of dollars, divided into forty thousand shares of the par value of one hundred dollars each, with power to increase said capital stock from time to time, and by such amounts as may be necessary to represent the cost of building and constructing the lines of telegraph, including submarine cables hereinbefore set forth, and the purchase of property of every kind necessary or useful in connection with the business for which this association is formed.

IV.

The names and places of residence of the shareholders of this association and the number of shares held by each respectively are as follows:

| *Names.* | *Residence.* | *No. of Shares.* |
|---|---|---|
| John W. Mackay | Virginia, Nev. | 20,000 |
| Isaac Bell, Jr. | Newport, R. I. | 10,000 |
| Hector de Castro | New York city | 5,000 |
| David B. Davidson | Brooklyn, N. Y. | 5,000 |

V.

The number of the directors to manage the affairs of this association shall not exceed thirteen, but such number may be increased or diminished as shall be authorized by a vote of a majority of the stockholders for the time being of this association, and the directors may designate and appoint such committees of their Board as they may see fit, giving to such committees all the powers of the Board, in so far as it may be lawful so to do, and may in like manner confer upon the president and vice-president of this association all such powers and duties as may be lawfully conferred upon and exercised by such officers.

VI.

The stockholders in this association and corporation are not, and are not to be, liable for the debts of the corporation, except in so far as there shall be any sum unpaid on stock subscribed for or held by them respectively.

VII.

This association shall commence on the 11th day of December, 1883, and shall terminate on the 11th day of December, which will be in the year 1933.

VIII.

This association has established and does hereby establish an office in the city, county and State of New York,

Witness our hands and seals this 10th day of December, A. D. 1883.

| *Subscribers.* | *Residence.* | *Number of Shares.* |
|---|---|---|
| John W. Mackay [L. S.] | Virginia, Nev. | 20,000 |
| Isaac Bell, Jr. [L. S.] | Newport, R. I. | 10,000 |
| Hector de Castro [L. S.] | New York, N. Y. | 5,000 |
| D. B. Davidson [L. S.] | Brooklyn, N. Y. | 5,000 |

*State of New York, City and County of New York. ss.:*

On this 10th day of December, A.D. 1883, before me personally appeared John W. Mackay, Isaac Bell, Jr., Hector de Castro, and David B. Davidson, to me known and known to me to be the individuals described in and who executed the foregoing instrument, and to me severally acknowledged that they executed the same for the uses and purposes therein mentioned.

MAURICE SPILLANE,
Notary Public,
New York County

# Electrical Review,

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*We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.*

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NEW YORK, DECEMBER 27, 1883.


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## The Aldermanic Mandate.

The New York Board of Aldermen last last week adopted the ordinance compelling the electric lighting companies to put their wires and mains under ground; giving the companies two years, beginning from next May, to find a means of accomplishing this. After the first of next May no wires for electric lighting may be strung above ground within the city limits, the officers of the several companies being held directly responsible for all violations of the ordinance.

To those who know the *personnel* of the New York Board of Aldermen, it is not at all strange that they should pass a measure before they knew what injustice its fulfillment would entail.

The New York Aldermen are as capable of passing upon scientific questions as they are upon those of a purely international character. It is but a short time since that they passed a resolution denouncing England in unmeasured terms regarding the Irish question and, by reason of their well-known reputation for ignorance, no one took the trouble to inform them that they had nothing whatever to do with international affairs.

In the present instance, impelled no doubt as much by that well-known mineral for which, it has been alleged, the aldermanic pulse perennially itches, as by the false charges against the electric light recently made, and still more recently disproved, the Board would not listen to further delay, a delay which would have given the electric lighting people time to show the falsity of the charges made, and to prove by expert testimony that no means had yet been found for sinking the electric mains.

Alderman Grant asked that the report of the finance committee, which had had the matter in charge, be laid over for a week in order that it might be fully considered. He said that, so far, no feasible system of underground wires had been discovered, and that it would be reckless to legislate on the matter at that time. Alderman Cochrane also favored delay, as it had been asserted that the only feasible system was that which made use of the sewers for the wires, and even that had failed in Paris.

A communication from the Board of Health reported that within three years there had been only one death by shock from an electric current, and two deaths from falls from platforms (in Union Square).

The question of delay was decided adversely by a vote of 18 to 6. Alderman O'Connor then proposed to send the report back to the Finance Committee, with instructions to make a comprehensive report providing for the placing of telegraph and telephone wires under ground as well as the electric light wires. To this proposition, Alderman O'Neil, Chairman of the Finance Committee, objected, on the ground that the representatives of the electric light companies desire to have their interest stand alone, and not to have it involved with that of the telegraph companies.

The lighting companies are to be congratulated that the Board of Aldermen did not pass the original draft of the bill which gave them only six months to discover a system of burying the wires and reorganizing their present system—the Board is capable of even worse folly than this.

Had the lighting companies been given only six months, it is safe to say that New York city would be compelled to go without the advantages of the electric light, for electricians, being only men, cannot perform miracles. It may even yet be doubted if much voltaic-arc lighting is done in this city, at least for a long time, after the ordinance shall go into effect. Even if the avenues were to a certain extent lighted with the voltaic-arc light, it is certain that no company would go to the expense of tunneling a side street in order to sell a few lights.

If the action of the Board of Aldermen is part of the scheme already outlined in the REVIEW, by which a little syndicate propose to monopolize the subway system for this city, the members thereof have little reason to congratulate themselves, for the boom didn't boom to any extent. The exemption of the telephone and telegraph companies from the exactions of the new law, removes from the value of the underground monopoly plan its most enticing elements, takes out the meat of the nuts from which pots of shekels were expected, and leaves only the shells. For the electric light people alone could scarcely afford to build great subways through the streets, and, as far as we have got at present, that seems the only way to get over the induction difficulty.

This being the case, we would tender, both to the would-be syndicate and to the arc-light people, our sympathy, though for widely different reasons.

The arc-light will surely be able to get along without the kind assistance of the syndicate, but the latter is likely to find the field from which it had expected such a rich harvest gradually assume the appearance of what our puritanical though blunt-spoken progenitors were wont to describe as a "rock farm."

## What a Critic Doesn't Know About an Incandescence Light.

An unjust and unmerited attack on the Edison incandescent light, appeared last week in the columns of a paper devoted to Wall Street interests and the stock market.

"Among the enlisted securities," it says, "few are so little traded in now as the electric light stocks. This is doubtless almost wholly due to the unfortunate experience of those who bought these stocks at fabulous prices when they first came on the market, and have since seen them go, comparatively speaking, almost out of sight. Of course the Edison companies, and their stock issues, made the market for this class of securities—and ruined it again also. A $100 share of the Edison Electric Light Company once sold on the street at $4,000. The same stock can now be purchased for $170, and the well informed doubt if it is worth even the latter small sum. Were it not for the prestige of Edison's name, which gave the stock its first boom, but could not save it from its final collapse, the stock would probably have no regular market price. It has never paid a dividend, and were it not for the auxiliary companies, which are simply construction and manufacturing companies, we doubt if it would pay its expenses."

We should like to ask the journal in question what it proposes to argue from this? Even were all this true, of which there is considerable doubt, would it affect the efficiency of the Edison incandescent light? We think not. Without "the prestige of Edison's name," his incandescent light may safely be looked upon as a success from a scientific point of view—whether or not it is a success from a commercial or economical standpoint, we are not informed, and therefore are not in a position to say. From our knowledge of the subject, however, we should think that it was.

"The light furnished, says the same authority, falls below the expectations of the company's partisans, and is regarded as a failure by the disinterested. An inspection of its light in many of the buildings where it has been introduced will satisfy any one that it is far inferior to the light supplied by two or three other companies whose names are but little known to the public.

This is not true. The light furnished does not fall below the expectations of the company's partisans, and is not regarded as a failure by any one who knows anything about the subject.

An inspection of its light, instead of showing it to be inferior will, on the contrary, easily convince the unprejudiced that it is not surpassed by any other incandescent light known in the market. Indeed it has at least one advantage—its color—which would incline some people to look upon it as a superior light.

It is certain that there is no other company, "little known" or well known, which has an incandescent light of superior quality to the "Edison."

Let us read a little farther:

"Less than 20 per cent. of the tenants of the Mills building are said to be using the Edison light, and from no lack of desire on their part for a superior light, either. The other evening we were invited by a friend to view his handsomely appointed offices, into which he had just moved, the principal feature of which he hoped would be the electric lights. He must have been greatly disappointed, however, for although there were a half dozen illuminated wires in each cosy room, in our judgment a chandelier hung in the center of each, with a similar number of jets, would have given a more satisfactory light. We do not believe that electric lighting generally is a failure. Indeed, we see ample evidences in various offices that it is being successfully used; but Mr. Edison must either perfect his system soon, or consumers will have to look to other companies for their light."

Whether twenty per cent. or one hundred per cent., or even five per cent. of the tenants of the Mills building use the "Edison" light, is of no consequence whatever, nor can it in any way affect the high estimation in which that light is held by those who know its value as an illuminant.

It is more than likely that fifty per cent of "the tenants of the Mills building" are as profoundly ignorant concerning incandescent light in general and the "Edison" in particular as is the writer of that conglomeration of mistakes and ignorance from which we quote.

Yet we will venture to allege from our knowledge of the "Edison" light and without knowing anything about the "tenants of the Mills Building," that no one in that building who has once used these lights has been willing to dispense with them.

One of the reasons why the complaining writer is opposed to the "Edison" system is that the same number of lights in a chandelier hung in the center of a room would, in his opinion, give a better light than the same number of lights when distributed. This is the quintessence of drivel. Neither the Edison Company nor any other company have any fixed system of arranging the lights. So far as the Edison company is concerned the complainant or his friend could have the Edison lights hung in the center of the room, on the roof, over the door, in the cellar, out of the window or even around his neck. As *Mr. Samuel Weller* remarked, when asked by the judge if he spelled his name with a V or a W: "it depends entirely upon the taste and fancy of the speller."

So the question as to just how electric lights should be hung, depends entirely upon the taste and fancy of those who are to use them.

We are glad to have the opinion of this high authority that "electric lighting is not a failure." We thought it was until he loomed up on the horizon with his valuable ideas on the subject, but hereafter we shall always regard electric lighting as a success.

We will not at this time give our opinion as to the motives which impelled the Wall Street journal to publish, and its co-conspirator, the *Times*, to copy, the article we have quoted. It is enough to say that they were sordid.

## The Arc Light Vindicated.

The most ardent admirers of that species of electrical lighting, known as the voltaic arc system, could hardly have hoped for so complete a refutation of its supposed evils and dangers as has recently been had, the necessity for which being a series of attacks made by more or less interested persons in the guise of public benefactors.

It could not be expected of those, whom folly or malice had prompted, to acknowledge their errors, even when confronted with the evidence of their falsity.

But the melancholy satisfaction is, at least, left to those who have been temporarily injured by unreasonable persecution to so expose the arts and processes of those who directed it that they shall henceforth lose the power for further mischief—to so blunt their claws and clip their wings that they may not again mount high enough to attract attention by their quacks to the follies of which these are the discordant precursors.

There could be no surer, no more effective way of doing this than by a series of rigid tests, made in public; and this is the plan that the arc light companies, thanks to their good judgment, have adopted.

First, as we have already chronicled, they made a careful examination into the facts concerning the alleged injuries which, according to an unscrupulous daily journal, were caused to man and beast and property by contact with the arc wires. In nearly every case these injuries were found to be mythical, with little or no foundation in fact—the testimony in rebuttal consisted, not in the unsupported utterances of a reporter pledged to make a sensation, but upon the sworn affidavits of eye-witnesses or responsible persons who had made official investigations.

Thus, a horse, alleged to have been killed by electricity, was found to be alive and well, and to have sustained no injury whatever from contact with the arc wires; men who were alleged to have been badly injured by electricity indignantly denied having made any allegations to that effect; a house, said to have been fired by electricity, was discovered to be uninjured; and lastly, the charge that many fires and much loss to property had been caused by the arc light wires was stoutly denied by Fire Marshal Sheldon, who exhibited transcripts from the books of the Fire Department to prove that only ten dollars damages had been sustained by New York property in two years and seven months by reason of contact with arc-light wires.

In order to still further demonstrate to the public how badly it had been hoodwinked by a certain portion of the daily press and other ill-advised persons, an exhibition was given, and a series of experiments were made last week, at the factory of the Weston Electrical Company, in Newark, in the presence of a number of scientific men.

In the adjusting-room of the factory, where forty arc lights are continually being tested, and where almost the full force of the dynamo machines is in use, the positive and negative wires of the machines were both grasped by gentlemen without any annoying results. The shock was strong, but not severe. At the further end of the circuit, after the entire number of lights had been fed from the force, the shock was trifling. At the point where the wires entered the room freshly charged by the machine the shock was more severe, but even then not of sufficient strength to injure a person in the least. Another interesting experiment was tried. A telephone wire on a working circuit was laid across two uninsulated electric light wires, conducting through it the entire strength of the circuit. This was handled by the visitors with perfect impunity and with the utmost freedom from danger. This wire was also touched to wood and other inflammable materials without exciting so much as even a single spark. During the evening an alarm was rung from the Newark Fire Department Head-quarters, and a stream of water was thrown upon both the positive and negative wires of the lines which furnish the lights in that city, without the person directing the stream experiencing any electrical sensations whatever. "The only occasions," said Mr. Curtis, who conducted the experiments, "when any lives have been lost with any electric light lines, and they have not been with our company in a single instance, have been those of linemen who have been careless in handling the wires. I have never heard of a single outsider being injured by electric light lines, except in the case of a Buffalo man who deliberately committed suicide by walking into a light station and catching hold of the two binding posts of the dynamo machine. He was instantly shocked to death."

The fact is the public have greater confidence than ever in the arc light system, and the recent assaults have given the projectors a fine opportunity to prove to the public satisfaction what was, by no means, generally understood before, viz.: that there is no danger from the arc-light system when it is properly established.

The benefits of this system may be witnessed on every hand. From obscure thoroughfares we are now gradually entering an epoch of brilliantly lighted thoroughfares; and the dull, flickering, uncertain gas-jet is, in many quarters of the town, so thrown in the shade that were it entirely extinguished no one would be the wiser.

Merchants vie with each other as to who shall have the greatest amount of electric light before their several stores, and a great benefit results to the public; a benefit which, if removed, would prove a severe loss.

### Mr. Kearny Objects to Wires on his Roof.

A very foolish person, Kearny by name, discovering that eight wires had been attached to the roof of his house, in West 29th street, this city, declares that all telegraph and telephone wires are nuisances, and should be torn down.

Doubtless this same man, should he wish to send an important dispatch, would inveigh roundly against the telegraph company if told by its agent that he could not send his dispatch because the wires were down. He would, no doubt, insist that the company, having been accorded a charter to carry messages, could not refuse to perform the service under any circumstances.

Mr. Kearny would seem to belong to that class of human beings, happily small, who cannot patiently put up even with the delays caused by the interposition of the hand of Providence, as exhibited in floods and thunder-storms and fires.

There is a class of persons who, indignantly thrusting the telegraph wires from off their own houses would howl with anguish if they could not transact their telegraphic business because their neighbors had imitated their example. To them it seems illogical and absurd that they should be called upon to make even the most trifling sacrifice to the general welfare and convenience of the public, while at the same time expecting to profit from the generosity and public spirit of their neighbors.

It is strange that such selfish persons should select the large cities for a dwelling—oases would seem to be far better adapted to their dispositions. But doubtless it is for the very reason that they hope to profit from the generosity of their neighbors without giving anything in return, that attracts them to thickly populated districts.

It is ten to one that the wires which this person complains of and threatens to tear down do not belong to a telegraph company, but to telephone and burglar-alarm companies, which are compelled, in order to reach the middle of the blocks, to cross the roofs of houses.

Considering the importance of the service which these wires perform, in calling the fire engines, the police, and messenger boys, to say nothing of the benefits of the telephone system, it seems somewhat bearish for any one to refuse them a crossing over the roof of his house. The very fact that the public has, only in exceptional cases, complained of them, goes far to show that it considers the advantages which they bring of far greater importance than the slight annoyance caused by their presence on the roofs.

If the public was made up of Kearnys, we would not have any telegraphs or telephones or electric lights or burglar-alarms, because it could not brook the crossing of its territory; we would have to fetch our own bread and groceries, and meat from the market, because the wagons of the baker and the butcher and the green-grocer make a rattling noise, which could not be tolerated; and, continuing this process of reasoning, we could neither have horse-cars nor steam-cars, nor any other thing that makes a noise—not even hand-organs—because they would infringe on our individual rights, and the only thing left for us would be to lock ourselves up in meanness, self-interest, churlishness, and egotism, and organize ourselves into a community of Kearnys.

Mark Twain tells us the meanest man he ever knew was a builder, who, when one of his men was blown up in the air by a blast, but fortunately returned to the ground unhurt, docked his pay while he was up in the air. But then Mark Twain didn't know Mr. Kearny.

### Improvements in the Gas-Motor.

So long as dynamos must be operated by means of the interposition of an auxiliary force, the question as to which is the most economical engine is interesting and important. Recent experiments have, it is safe to say, abundantly demonstrated that the gas engine or moter is superior to all others for driving the dynamo, by reason of its economy.

In the use of coal direct for the generation of steam, there is, as is well known, a great loss; for under the most favorable circumstances only about 15 per cent. of its theoretical power may be recovered in work.

In gas-making, we are told in good authority, that under normal conditions of market, the residuents will fetch a sum sufficient to pay for its manufacture, so that were it given away, its manufacturers would lose nothing. From this, as may be seen, a fuel gas requiring by no means so much care in manufacture as illuminating gas, may be sold at a low figure and yet bring in a good profit.

Again, there can be no more convenient fuel than gas, for it requires no handling when once the plant is established; there is no dust, no cinders nor clinkers.

For these reasons, the scientific world is not a little interested in all improvements, in the gas engine or motor.

Gas engines have proved so useful in places where a low and easily-managed power is in demand, that many efforts have been made to reduce the cost of such motors and make them as effective as possible.

A recent invention in this field deserves attention, because it appears to give a decided gain in economy over others of its class. This springs from the fact that every second stroke of the piston, or every revolution, develops power, some other motors of this class giving power only on every fourth stroke. No gas engine appears likely to develop power on every stroke, as the mixture of air and gas burned in the cylinder will not escape, like steam, from the cylinder, after it has done its work.

It appears to be necessary to wash or sweep out the products of combustion after each explosion in the cylinder to make the machine work.

In the new gas-motor two cylinders are employed, one called the displacing cylinder, or displacer, and the other the working cylinder. It is the duty of the displacer to remove the products of combustion and then to recharge the working cylinder after each outward stroke.

This motor is interesting because of the peculiar arrangement and duties of these two cylinders. Their actual position and connection with the other parts of the machine are of less importance and need not be here considered.

The displacing cylinder is much larger than the working cylinder, and they may, for our purpose, be imagined as placed side by side, with the piston rod of each connected with the crank shaft at right angles.

If the engine has just completed a working stroke, the piston bf the displacing cylinder is just ready to advance. During the first half of its stroke, it draws into the cylinder the mixture of air and gas that is to be burned in the working cylinder.

At mid-stroke the inlet stroke is closed, and another is opened, admitting pure air during the remainder of the stroke. At this point the piston in the smaller cylinder is just finishing its effective stroke and the connection between the two is opened. The fresh air taken in during the last half of the stroke of the displacer, is now free to enter the working cylinder, and, as its exhaust is still open, the pure air enters and passes through the working cylinder, driving out the products of combustion, in turn, after washing or cleaning it out on its way. At the right moment the exhaust is closed, while the explosive mixture that follows the pure air enters and fills the cylinder. The piston, on its return, compresses the mixed air and gas, and, at the right instant it is fired and the explosion drives the piston back on its effective stroke.

The points of interest here appear to be in the development of the second cylinder and the use of pure air to wash out the working cylinder and drive off the products of combustion before the gas is admitted and compressed.

There is, besides the gain of making the working cylinder perform its duty at every second stroke, the economy of moving a lighter piston to prepare the charge of gas at the same time that work is being performed. The current of pure air forced through the working cylinder cools the parts and puts out any sparks that might still burn after the explosion, and that, if not extinguished, might cause a premature explosion.

This motor has been made the subject of exhaustive experiment, but it has, in great measure, withstood the most severe tests, and came out as a practical working success.

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A student submits the following statements of his views, and requests our opinion as to their correctness.

He says first:

"I say that the quantity of electricity passing through the semi conductor in a Blake transmitter, *e. g.*, is a very small portion of the electricity of the battery."

This is true and it is not true. The current generated by a given battery depends not only on the electromotive force of that battery, but also on the resistance of the circuit. Therefore the quantity of electricity passing through the contacts of a Blake transmitter is fully equal at any time to the current flowing in any other part of the circuit.

Yet if we reduce the total resistance of the circuit in any way, the current generated by the battery will be greater; and similarly if we increase the resistance of the circuit at any point, the current generated will be less.

2. "Now, when the plates vibrate, the additional quantity of electricity caused to flow through the semi-conductor is likewise a very small fraction. After all, a very slight portion of the energy of the battery is utilized, let us say, for comparison, a third part, and the balance is lost."

When the diaphragm in vibration recedes from the speaker, the contact pressure is increased, the resistance reduced, and the current increased. When the diaphragm returns, and vibrates towards the speaker, the contact pressure is decreased, the resistance increased, and the current passing correspondingly decreased. If the full amount of current which the battery is capable of generating were to pass through the electrodes when at rest, the changes during the operation would be all in one direction, *i. e.*, that of decrease; and as the volume of sound depends not on the strength of current, but upon the amount of change in the strength of current, the resultant effect would by no means be advantageous.

3. "I say that the current in the secondary wire will be stronger, and consequently the sound will be louder, and transmitted at a longer distance by using two batteries instead of one. I do not understand why it is said that a weak current will be as efficacious as a strong one. Two batteries must give more electricity, and then more effect. Is it because the semi-conductor lets pass always the same quantity of electricity, either of a weak or a strong battery?"

The induced current *is* proportionate to the volume of the primary current; but, as above stated, the strength of sound is proportionate not to the strength of primary current, but to the extent of variation.

Two batteries are better than one, because the extent of their power is capable of greater variation; but it is not usually judicious to use more than two, because first, the spark produced at the contact points by the passage of the current becomes detrimental; and, secondly, because the entire resistance of the circuit being so low, the internal resistance of the added cells adds thereto, in almost the same proportion as the electromotive force is increased.

4. "Why the Edison carbon-transmitter, the most powerful transmitter it is said, is not used now? In what is it inferior to a Blake?"

The Edison carbon-transmitter is undoubtedly a very powerful type of instrument. The principal reasons that it is not more used, are that it is not popular on account of the close proximity which the speaker's lips have to assume to the mouthpiece, and the consequent annoyance to other speakers using the same transmitter.

5. "I would like to have a book explaining clearly and thoroughly the mechanism, etc., of telephony in general, as for example the influence of electrical energy on loudness of the voice, the obstacle to transmission to longer distances, the best systems in use, etc."

There is no book that covers the entire ground. The literature published on this subject is as yet by no means extensive.

The only books which can readily be procured on telephony, are:

"The Speaking Telephone, Electric Light," etc.; Prescott. "The Telephone, Microphone," etc.: DuMoncel. "Practical Information for Telephonists," Lockwood.

### Poor's Manual for 1883.

This excellent book opens with a review of the business of all the lines for 1882, showing increase and decrease in mileage, laws, maps, expenses, &c. From this statement it appears that of the 113,329 miles of track extant at the close of 1882, 11,591 miles were constructed during that year; the average mileage operated, during the year, being 107,138.

The amount of share capital issued by the several companies up to the close of their respective fiscal years is set down at $3,456,078,196—an increase over the previous year of $385,254,585. The funded debts of the various companies had an increase of $352,554,496, making a total of $3,184,415,201—while their united floating or unfunded debts amounted to $255,170,962—giving for the year an increase of $142,404,965. The total increase of share capital and floating and funded debts combined amounted to $780,-213,776; while the total sum of all liabilities at the close of the year was $6,895,664,359; giving a total per mile for completed mileage of $61,342. Comparing 1881, we find the total of stock and liabilities to have been, at the close of that year, $6,115,540,583—equaling $57,730 per mile; 1880, total $5,373,015,-928—per mile, $58,949; 1879, total $4,872,-007,517—per mile, $59,985.

The gross earnings of all the roads for their several fiscal years, of 1882, were $770,356,-716—an increase of $67,066,511.

Of the gross receipts, $202,140,775 were from passengers; $506,367,247 from freight, and $61,848,734 from miscellaneous sources. The net earnings for the year footed up $310,682,877, an increase of $25,929,109. The amount of interest paid, $149,295,380, shows an increase of $20,708,078 over 1881; while the dividends paid, $102,031,434, include an increase of $9,687,244 for the previous year. The percentage of gross earnings to investment during the year was 11.2 per cent; in 1881, 11.5; in 1880, 11.4; in 1879, 10.8. The percentage of net earnings to investment in1882 was 4.5 per cent.; in 1881, 5.1; and in 1879 4.4 per cent. The earnings per mile of all the railroads operated for 1882 were, gross $7,088; net $2,899. In 1881, gross $7,527; net $3,040. In 1880, gross $7,435; net $3,293. In 1879, gross $6,652; net $2,761.

### Telephone Stock Quotations.

| | |
|---|---|
| American Bell Telephone Company | 186 |
| Central New York Telephone and Telegraph Company | 103 |
| Empire State Telephone and Telegraph Company | 205 |
| Hudson River Telephone and Telegraph Company | 105 |
| New York and New Jersey Telephone Company | 85 |
| Mexican Telephone Company | 3¾ |
| New York and Pennsylvania Telephone Company | 80 |
| Southern Bell Telephone and Telegraph Company | 130 |
| Tropical Telephone Company | 2½ |
| Central Union Telephone Company | 100 |
| Iowa Union " " " | 91 |
| Missouri and Kansas Telephone Co. | 92 |
| United Telephone Company (Kansas and Missouri) | 89 |
| Bell Telephone Company, of Missouri | 165 |
| Wisconsin Telephone Company | 125 |
| Cumberland Telephone Company | 100 |
| Great Southern Telephone Company | 100 |
| Michigan Telephone Company | 105 |
| Chicago Telephone Company | 286 |
| Erie Telephone Company | 59 |
| Union Telephone Company | 100 |
| Southern New England Telephone Company | 178 |
| New England Telephone Company | 74 |

### BUSINESS NOTICES.

**The Tahanto Manufacturing Company,**
**42 Batterymarch Street,**
MANUFACTURERS OF ART METAL WORK.

BOSTON, December 8th, 1883.

*Mr. A. F. Upton, Treasurer Jarvis Engineering Co., Boston.*

DEAR SIR,—It gives me much pleasure to testify to the excellent work that the Armington & Sims Co. engine is doing for us as a motor for the general machinery of our factory. We require it to furnish power for grinding and polishing wheels, saws, lathes, etc., and a number of dynamo-electric machines, for which the speed must be perfectly steady.

We started the engine on the 28th of August last, since which time it has been constantly at work, night and day, from Monday morning until Saturday night of each week, or, in other words, one hundred and thirty hours a week for fourteen weeks. During this time it has not once been necessary to stop it for repairs of any kind, and not a dollar has been spent for that purpose. From this time forward we intend to run without stopping even for Sunday, and we feel confident, from the work it has already done, that it is fully equal to this unusual service. Very truly yours,

SIDNEY L. HOLDREGE, Treasurer and Mangr.

## ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING DECEMBER 18, 1883.

290,199 Magneto-electric machine; Clinton M. Ball, Troy, assignor to himself and John B. Tibbits, Hoosic, N. Y.

290,292 Electric lighting; Henry Van Hoevenbergh, Elizabeth, N. J.

290,302 District signal apparatus; John Cornelius Wilson, Boston, Mass.

290,307 Circuit for telephone apparatus; Charles E. Allen, North Adams, Mass., assignor of one-half to Ira J. Meagley, Binghamton, N. Y.

290,338 Electric railway signal; Geo S. Maxwell, Louisville, Ky., assignor of one-half to Charles Knight Caron, same place.

290,350 Magneto-electric machine; Henry M. Paine, Newark, N. J., assignor to Henry W. Morehouse and Bennett Osborn, both of same place.

290,375 Electric cable; Richard S. Waring, Pittsburgh, Pa.

290,388 Signal apparatus for railways: Melville Cox Bragdon, Newton Highlands, Mass.

290,406 Switch for electric lamps; Henry Edmunds, Jr., New York, N. Y., assignor to Thomas J. Montgomery, Boston, Mass.

290,407 Circuit connection for electroliers; Henry Edmunds, Jr., New York, N. Y., assignor to Thomas J. Montgomery, Boston, Mass.

290,412 Regulator for dynamo-electric machines; J. Edwin Giles, Hazleton, Pa.

290,413 Conduit for electric wires; Christian H. Goebel, Philadelphia, Pa., assignor to American Sectional Electric Underground Company of New Jersey.

290,414 Underground conduit for electric wires; Christian H. Goebel, Philadelphia, Pa., assignor to the American Sectional Electric Underground Company of New Jersey.

290,415 Underground conduit for electric wires; Christian H. Goebel, Philadelphia, Pa., assignor to the American Sectional Electric Underground Company of New Jersey.

290,416 Underground conduit for electric wires; Christian H. Goebel, Philadelphia, Pa., assignor to the American Sectional Electric Underground Company of New Jersey.

290,441 Electric gas-lighting burner; Adam Lungen, New York, N. Y., assignor of one-half to Robt. Edwards, same place.

290,467 Incandescent electric lamp; Charles G. Perkins, New York, N. Y., assignor to the Imperial Electric Light Company, same place.

290,468 Automatic regulator for storage batteries; Charles G. Perkins, New York, N. Y., assignor to the Imperial Electric Light Company, same place.

290,469 Electric lamp and switch; Charles G. Perkins, New York, N. Y., assignor to the Imperial Electric Light Company, same place.

290,470 Automatic electric circuit maker-and-breaker; Charles G. Perkins, New York, N. Y., assignor to the Imperial Electric Light Company, same place.

290,495 Magnetic call; Henry Thaw, New York, N. Y.

290,550 Dynamo-electric machine; James Du Shane, South Bend, Ind.

290,551 Dynamo-electric machine; James W. Easton, New York, N. Y.

290,556 Means for controlling printing circuits of printing telegraphs; Stephen D. Field, New York, N. Y., assignor to the Commercial Telegram Company, same place.

290,557 Printing telegraph; Stephen D. Field, New York, N. Y., assignor to the Commercial Telegram Company, same place.

290,602 Railway telegraph; William D. C. Pattyson, Marlborough, Mass., assignor of two-thirds to Horace S. Crowell and Edmund E Bond, of same place.

290,611 Plate for batteries; William Taylor and Frank King, London, England.

290,613 Printing telegraph; William B. Vansize, Brooklyn, and Charles L. Buckingham, New York, assignors to the Western Union Telegraph Company, New York, N. Y.

290,635 Printing telegraph; Stephen D. Field, New York, N. Y., assignor to the Commercial Telegram Company, same place.

290,654 Electric battery; Georges Gaetan Louis Velloni, Paris, France.

General Halbert E. Paine, the well-known commander of the famous "Iron Brigade," in the Army of the Potomac, and more recently Commissioner of Patents, we were glad to notice, a few days since, has established one of the largest and most promising patent agencies in Washington. We can commend our friends, who are seeking a valuable agency, to take charge of and obtain patents on their inventions, to the care of the General and his able assistant, Story B. Ladd, Esq., for we know that they will be fairly treated and their cases efficiently managed.

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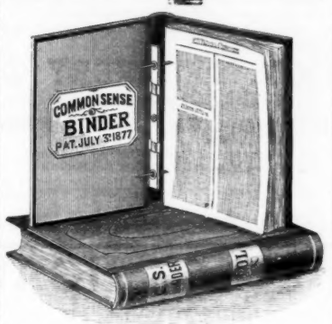


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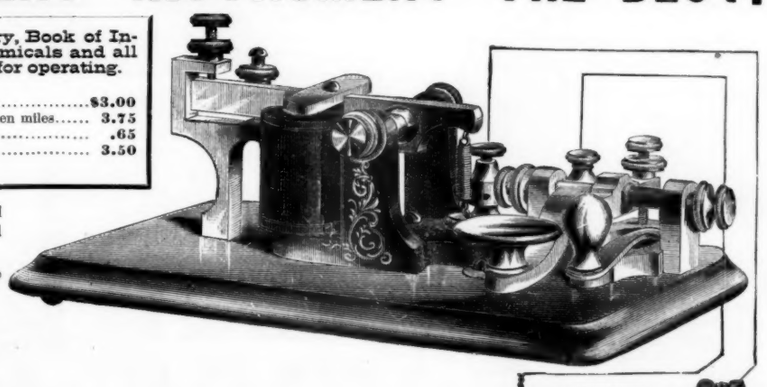

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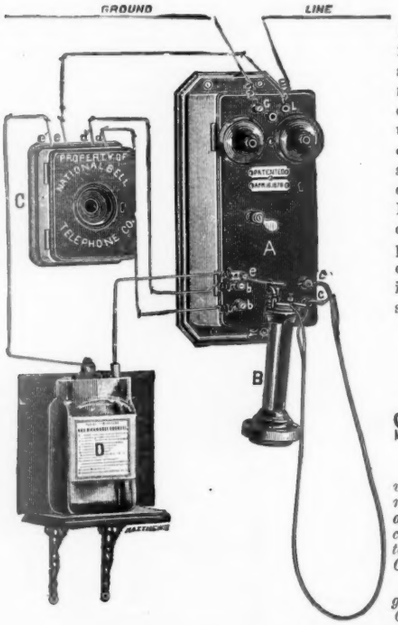


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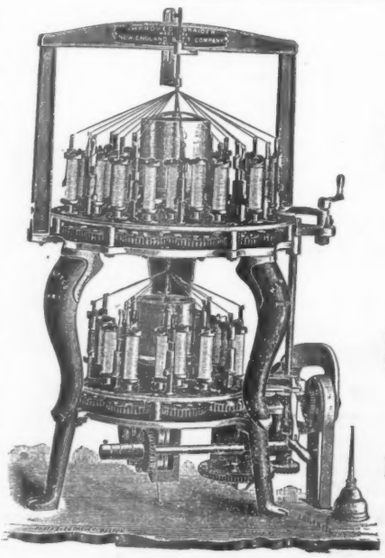

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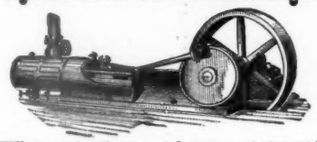

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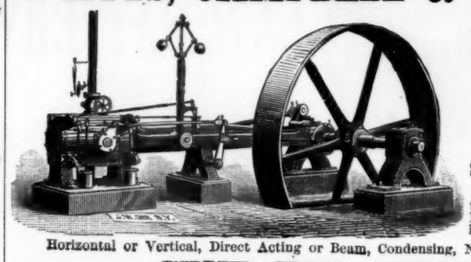

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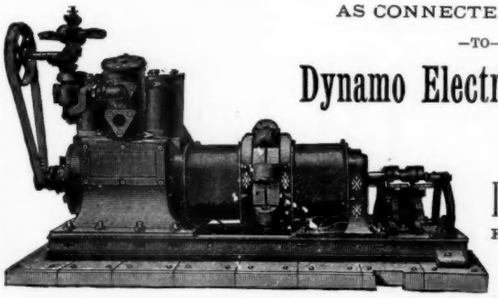

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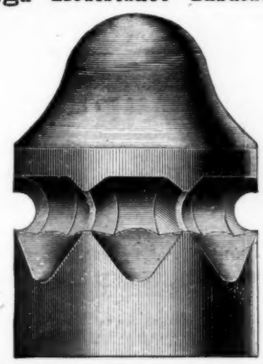

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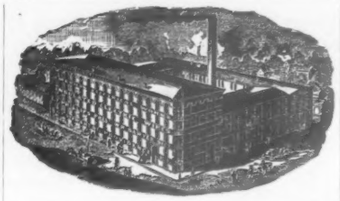

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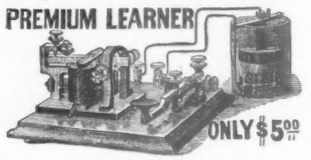


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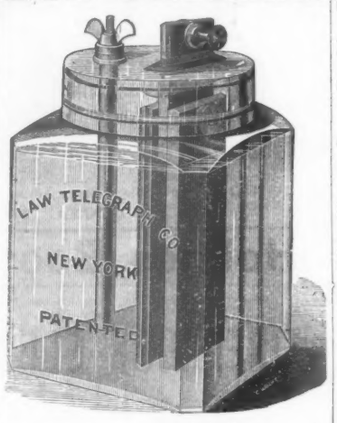


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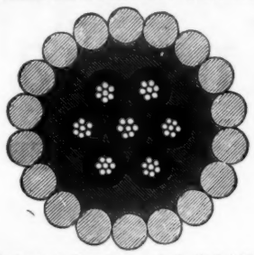

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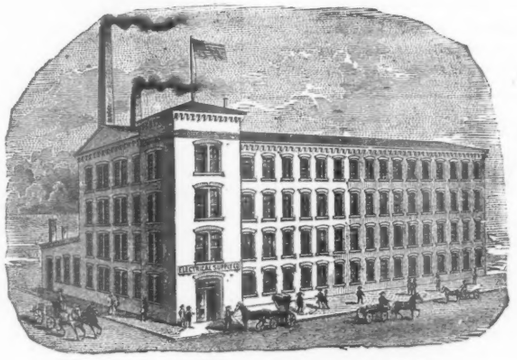

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